THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XIX. No. 462—22ND YEAR.] LONDON, JUNE 21, 1870. [Subscription { 15s. in Advance. / 18s. Credit. } per Annum. DOUBLE No. Price 1s.

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THE TESTING-HOUSE REPORTS.
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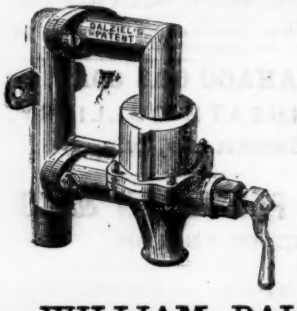

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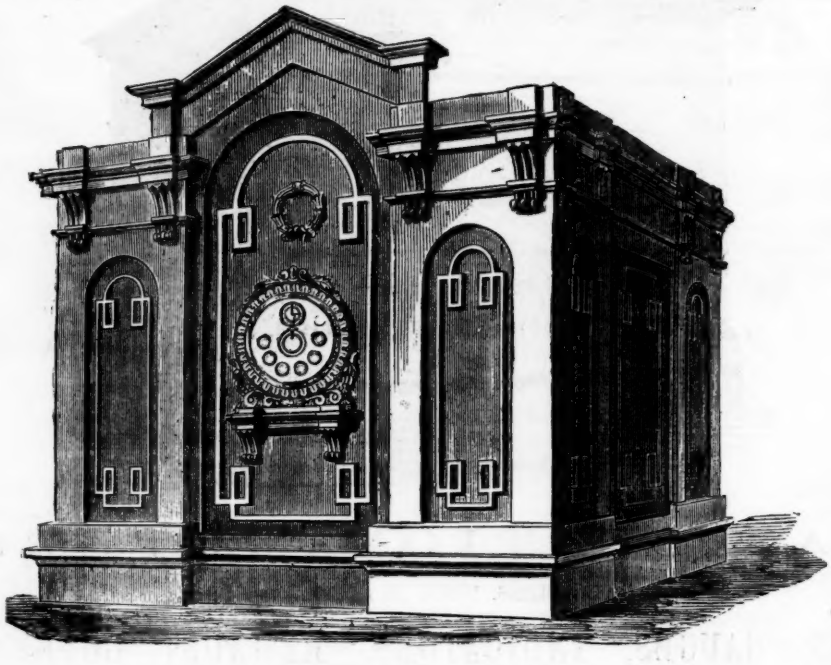

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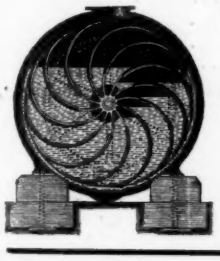

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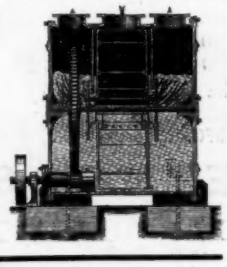

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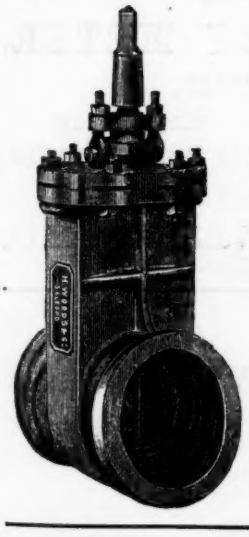

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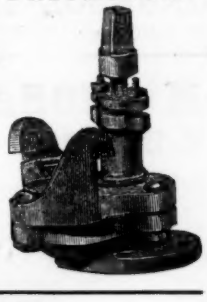

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(COPY.)

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Norfolk Silkstone . .	11,000	15·94	12·5	4·4	1·64
Silkstone Brights . .	11,500	14·5	12·6	7·4	1·85
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NOTE.—The illuminating power of the Gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

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beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large Stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all Sizes kept in London at Mr. ALFRED WILLIAMS, Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

TANGYE BROTHERS & HOLMAN,

ENGINEERS, MACHINERY AGENTS, AND MANUFACTURERS,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.;

And BIRMINGHAM (TANGYE BROTHERS), CORNWALL WORKS, SOHO.

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS.

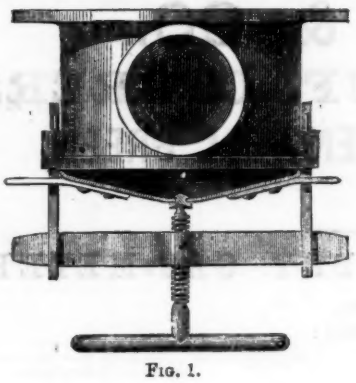

FIG. 1.

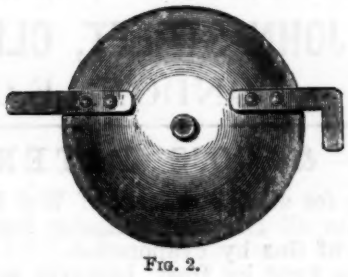

FIG. 2.

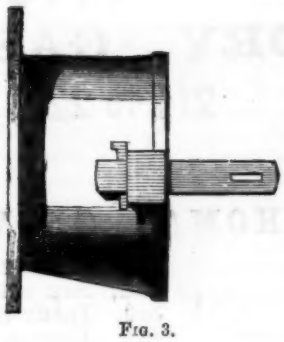

FIG. 3.

Several Hundreds in successful operation in various Gas-Works.

The expensive and cumbersome process of sealing the mouths of Gas-Retorts by means of luting the Lids with lime and other materials hitherto used for that purpose, is henceforth rendered unnecessary, and will be superseded by the very efficient method shown in the accompanying illustrations.

Fig. 1 shows a plan of a mouthpiece with Morton's Patent Lid in section. The mouthpiece is faced true, and the projecting circular edge or periphery of the lid is also turned true, and, by preference, of a semicircular section, so that the point of contact is reduced to a minimum; the convex form of the Lid rigidly sustains the force of the screw, which, by its central action, gives the Lid a uniform bearing, and effectually seals the mouth of the Retort.

Fig. 2 shows a front view of Morton's Patent Lid, which is stamped out of plate iron, having (in this case) ledges to rest on the lugs of the mouthpiece; these Lids, however, are more generally fitted to hinged cross-bars, by which means they remain suspended while the charge is withdrawn and the Retort charged, so that the damage done by throwing them about is entirely prevented.

The advantages obtained are—

1st. The sound sealing of the Retort during the whole time it is carbonizing the charge of coal, there being no jointing medium between the Lid and the mouthpiece.
2nd. The improved condition of the coke by the non-mixture of lime.
3rd. The Lid requires no preparation on the part of the stoker, beyond slightly scraping the surface to remove extraneous grit or dirt.
4th. The Lids are only about two-thirds the weight of the old form in general use, a Lid for a 16-inch mouthpiece weighing a little over 20 lbs.
5th. The Self-sealing Lid reduces labour, saves wear and tear, obviates all the inconvenience and discomfort consequent on the preparation of luting, and effects a great reduction in the working expenses. The cost attending the process of "luting" in several large gas-works, exceeds £1000 per annum, ranging in various works from 20s. to 35s. per mouthpiece.

It will be obvious that a round Lid is the most convenient and the cheapest form. D Retorts are adapted for round Lids, by carrying the bottoms down the necessary depth for that purpose, as shown in Fig 3. Some mouthpieces have been thus adapted, and are in use at the Chartered Gas-Works.

The following testimony speaks in favourable terms after ample and careful test:—

Burslem and Tunstall Gas Company, Longport, Staffordshire, Oct. 12, 1869.

Dear Sir,—In reply to your favour of the 9th inst., I have pleasure in stating that my admiration for your Patent Retort-Lid is most unqualified. I have 14 of them in use, and have tested them in the severest manner possible at these works, but without being able to detect the slightest defect. Yesterday the strap slipped off the exhauster, and a pressure of 13 inches was thus almost instantly thrown upon the Retorts, but although many of the luted Lids were leaking, not the slightest escape was observable from yours. I had anticipated that at least some greater degree of care would have been required in the scraping of the mouthpieces after the drawing of each charge, but even in this particular I find that labour has been reduced.

By every stoker on these works, as well as by myself, your Lids are regarded as a boon.

Please send me 30 more at your earliest convenience.

I am, &c., (Signed) HENRY WOODALL.

R. Morton, Esq.

Chartered Gas Company, Horseferry Road, Westminster, Sept. 15, 1869.

Dear Sir,—I have only lately returned to town, which is the reason I have not replied earlier to your inquiry.

I beg to say that I have had your Lids in use for upwards of two months, and during that time they have always kept a perfectly sound joint. I may add that where your lids are used only one set is required.

I remain, &c., (Signed) G. O. TREWBY.

R. Morton, Esq.

Chartered Gas Company, 146, *Goswell Street, E.C., Oct.* 20, 1869.

Dear Sir,—I have much pleasure in stating that, after some months trial of your Retort-Lids, I find them everything I could desire. I consider the plan a great improvement.

I am, dear sir, yours truly, (Signed) A. UPWARD.

R. Morton, Esq., London Gas Company.

These Lids are in successful use at the London Gas-Works, the Chartered Gas-Works, the Dublin Gas-Works, the Burslem and other Works, giving great satisfaction.

Application for Licences and other Information to be made to

TANGYE BROS. & HOLMAN, 10, Laurence Pountney Lane, London, E.C.

Sole Makers of Upward's Patent Safety Drilling Apparatus, Weston's Patent Differential Pulley Blocks, the "Special Steam-Pump," the Patent Duplex Lever Punch, &c.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF

PATENT WET & DRY METERS,

STATION-METERS AND GOVERNORS,

PRESSURE REGISTERS, GAUGES,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c., &c.

WATER METERS.

W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

NOTICES.

The subscription to the JOURNAL is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders should be made payable at the Money-Order Office, London, to William B. King, 11, Bolt Court, Fleet Street, by whom the business department of the JOURNAL is conducted.

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This JOURNAL has been duly registered at the General Post-Office for transmission abroad.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 21, 1870.

Notes upon Passing Events.

THE Bill "For Amending and Extending the Acts relating to the "Navigation and Conservancy of the Thames" has come out from the committee's revision in a very useful shape, although severely clipped of the claims which the Conservators made in their first draft. Under section 10 the committee of management of Putney Bridge are compelled to widen the centre arch, in accordance with deposited plans and section, within twelve months after the passing of the Act. Thus a great nuisance will be abated. Putney Bridge may be entirely reconstructed without the necessity of going to Parliament again. The monopoly of the Watermen's Company is destroyed in a very simple manner under clause 13—"*Any person* (not being an apprentice) may apply to the Watermen's "Company for a certificate to act as a waterman, as a lighterman, or "to navigate a steamboat on the Thames below Teddington Lock, "after examination and production of evidence of competency." If the company, moved by old prejudices, refuse to grant or renew any certificate, the applicant may appeal to the Conservators—a very necessary power of appeal. The Watermen's Company, by clause 16, are compelled to print and send printed copies of their balance-sheet to the Conservators and the Board of Trade, and if at any time the Board considers that the income is more than sufficient to meet the proper expenditure of the company, it may order the fees on grants and renewals of licences to be reduced. The Conservators are to have power to appoint inspectors of steamboats and other craft navigated on the Thames. By clause 22 the Metropolitan Board of Works are bound, at their own expense, to keep the Thames free from any banks that may arise from the flow of sewage at the outfalls, and if any difference arises on this question between the Conservators and the Metropolitan Board, it is to be settled by arbitration. Pleasure boats are very properly subjected to registration, regulation, licence, tolls, and duties, it being always understood that these charges are to be "reasonable." The Conservators take powers to purchase, abolish, or rebuild the Royal Terrace Pier at Gravesend. The Smoke Nuisance Abatement Act, so far as it relates to steam-vessels, is placed at the disposal of the Conservators. Altogether the labours of the committee seem to have made this Bill useful and workable.

Some time since we described in detail the scheme recommended by the Court of Aldermen for dealing with small charities that had outlived the intentions of the founders. We then condemned the scheme as one for founding a charity in which the great bulk of the funds would be wasted in unwieldy plant and machinery. The scheme has since been embodied in a Prison Charities Bill, which contemplated taking possession of useless charities—a very sound idea—placing them under the control of thirty-three elected governors and the whole Court of Aldermen (to whom the patronage was to be given), devoting the funds to building and maintaining an industrial school and training ship for unconvicted vagabonds of both sexes, to be nominated by the governors. We pointed out, at the time the scheme was first propounded, that if the leading idea was sound, it would be much better carried out by subscribing to existing institutions than by sinking a large capital in land, buildings, and a ship; further, that the nomination patronage would inevitably lead in a very short time to gross abuses—a sort of Christ's Hospital nomination of pauper children. The committee of the House of Commons to which the Bill was referred took the same view, and reported "That in the case of "the Prison Charities of London Bill they had examined the "allegations contained in the preamble of the Bill, but the same "had not been proved to their satisfaction." The chairman further reported, "That with respect to the petitioners—viz., the "President and Treasurers of St. Thomas's Hospital, they are "unanimously of opinion that they have been unreasonably sub-"jected to expense in defending the rights proposed to be inter-"fered with by the Bill, and are entitled to recover from the "promoters of such Bill—viz., the Corporation of London—their "whole costs."

Mr. Ayrton has evidently found his Nemesis on the Treasury Bench. His official duty compels him to press on the Kensington Road Bill, which in his heart he detests. The Bill itself is harmless enough, and will not really destroy any trees worth preserving. But the House of Commons is only too happy to find an opportunity of resenting the many snubbings it has received from the First Commissioner of Works, both in his private and in his official capacity, and of resisting the encroachments represented by that truly indefatigable C.B., Mr. Henry Cole. A popular First Commissioner would have had no difficulty in persuading the House of Commons that he was carrying out a great public improvement. Linked with a new scheme for replanting the Park with trees suitable to the site, it would have passed triumphantly. But the opposition are not very clever. Why does not Mr. Alderman Lawrence challenge Mr. Ayrton and the Treasury Bench to show the same zeal for removing the dangerous gut of Park Lane that they do for displaying to the best advantage the Albert Monument and Albertine gasometer of omni-science, where music and the ballet are to flourish on a subsidy of ten thousand a year—if the House of Commons can be caught in good humour? The two questions are fair subjects for a compromise. All great questions are settled in Parliament by compromise. Let the Duke of Cambridge have a share of deserted St. James's Palace, with a substantial amount of purchase-

money for Gloucester House, and let the illustrious personages interested in the Kensington Road Bill have their slice of the Park. Thus every one would be benefited, and no one injured. The public would get the use of Park Lane, Kensington Gardens and Road would be improved, the Duke of Cambridge would use unused banqueting-rooms for official dinners, and be able to invest the real value of his white elephant much to his advantage. We commend this negotiation to the care of Sir John Thwaites. It would gracefully crown his official career, and prepare the way for his retirement and pension.

The Education Bill, the most important "active" Bill of the session—for it is meant not to remove a grievance, but to create healthy social life—is working its way slowly through the House of Commons, in spite of the peculiar obstacles presented by religious competition. Religious competition is the difficulty. To it we owe nearly all the voluntary efforts hitherto made to educate the people. The Dissenters first saw the advantage in a proselyting view of schools, Sunday and week day, and did great things with the Lancaster system. The Established Church then took up the running, and went away in front, with Dr. Bell and all the advantages of plant and machinery—a parson and a parish clerk in every village, besides at least one sympathizing squire or squiress. When thirty years ago Sir James Graham propounded a plan that would have left very few totally ignorant in the present day, the Dissenters, very naturally preferring religious power to general education, rose up and defeated him. Once more the question is being discussed, but this time under the pressure of a strong public opinion which insists that, in some way or other, the people shall be educated. The Church of England, converted to a degree of liberality most amazing to the remnants of the last generation, say, surely you would not destroy the Church—that is, denominational—schools we have built up in ten thousand parishes, when we are willing to accept the most stringent conscience clause, and let every little Wesleyan, Baptist, and Congregationalist sit apart or retire before the master enters on the dogmas of the Cafechism. But, says, in reply, the Dissenter, if your school is to be supported by rates, there will be no chance for our (say British) school, because wealth and completeness will draw all children to your school, therefore we should prefer all schools to be entirely undenominational. But, says Mr. Vice-President, the only way to secure absolute neutrality in teaching is to make schools purely secular, and to that the great majority of England is opposed. Then come the Roman Catholics, powerful and numerous in Manchester, Liverpool, Leeds, and all the manufacturing districts where high wages have created colonies of Irish. The Roman Catholics ask to be assisted in supporting schools where no Protestant children shall intrude—that is, they ask for State aid or rate aid for purely denominational teaching. Of course, all shades of Protestants object to be taxed for any such purpose. Amidst these divisions, Mr. Forster, whom the Dissenters once claimed as their special representative, spurred by a noble ambition to do something in educational legislation, and finding it impossible to please everybody, seems inclined to push on and please himself. The fact is that all the parties are right from their own point of view, but the Government and the nation feel that a solid education is of more importance than any shade of religious difference, and that it must be diffused, even at the risk of unfairly supporting the most wealthy division in the State, the Church of England. In Wales, the children frequent the Church schools to learn English, and, having learned it, adjourn to their Calvinistic chapels.

Mr. Bailey Denton has issued a pamphlet on the all-important subject of "Village Sanitary Economy," which should be in the hands of every landed squire, every village parson and schoolmaster. Unlike most publications of the same kind, it is from first to last eminently practical. Great towns, beside municipal machinery of one form or another, have the protection of newspaper correspondence and newspaper articles to point out abuses, convey information, and stimulate local public opinion. Villages alike enjoy and suffer from neglect and ignorance. Not long since we quoted the example of a Nottinghamshire village, which, with every advantage of site, had become a perfect pest-bed of disease. Mr. Denton has collected the information required to enable village authorities to make the best of their position. Pure air will not give health if pure water be wanting, nor a gravelly nor a chalk soil if saturated with the drainage of privies and cow-sheds. Woburn is less healthy than Bedford, and Frome than Bath. Mr. Denton, in his first pages, gives a summary of all the Acts affecting the local government of villages and small towns. His first practical chapter is devoted to "the condition of the "dwellings of the labouring class." Passing over the building and ventilating questions, we note that he objects to cesspools, "because they are never made water-tight, and therefore pollute "neighbouring wells;" and he dwells on the necessity of draining and paving the back-yards of cottages, because much of the insalubrity of villages is due to the "excrement-sodden" condition of the ground surrounding the cottage, upon which "urine from the chamber, foul water in which clothes are washed, "and the refuse of the scullery" are poured. To the cardinal question of water supply Mr. Denton devotes his most important chapter, and fills it with descriptions of all the cheap contrivances that are within the reach of the funds of a village. For this section alone he deserves the warmest thanks of village communities—it is so much easier and more remunerative to plan gigantic and even impossible engineering works than to describe simple arrangements to be carried out without shares or debentures, loans, boards of directors, or consulting engineers. So far from villagers being as a rule well supplied with water, "while the "residents of our towns are paying after the rate of between "1s. and 2s. per 1000 gallons for water delivered to every floor "in their mansions, it is not an uncommon circumstance for the "poor of a village to pay as much as a penny for a single pailful "of two gallons, or after the rate of £2 1s. 8d. per 1000 gallons "when carted or carried to their door!"

Of all classes of the community, agricultural labourers are the least given to personal ablution and house-cleansing; the quantity of water, therefore, used in cottages is less than that required in the lowest class of urban dwellings. This is probably owing, first to the difficulty of getting water in sufficient quantity, and next to the existence of pure air surrounding villages, which naturally maintains a cleanliness superior to that attainable amidst the smoke and gas which pervades the atmosphere of towns. The quantity of water used in towns, where there exists the advantage of a public supply, varies very considerably. The maximum quantity will probably somewhat exceed 50 gallons per person per diem (example, Lynn, in Norfolk), while the minimum will hardly reach 10 gallons (example, Stroud, in Gloucestershire). In the east of London the charge is 20s. a year for a house containing six rooms and a wash-house, and the East London Water-Works Company endeavour to supply every house of this description, containing on an average seven persons, one pint per minute throughout the day, or 180 gallons per diem.

Taking into consideration all the circumstances—personal and physical—attending village communities, it has been considered that a daily supply of 10 gallons per head is the least quantity that should be provided for them wherever a public supply is established, and that every cottage with three bedrooms should have the command of 50 gallons a day, or 350 gallons a week. For this quantity, without labour on the part of the recipient of fetching and drawing but which would be obtainable by simply turning a tap or raising a pump-handle, it is considered that the labouring cottager can, under any circumstances, afford to pay 2d. a week, or 8s. 8d. a year, and that other residents in villages should pay in proportion to the rateable value of their dwellings.

Mr. Denton, in treating of water supply from private sources, points out that wells, to be safe, must be perfectly protected from sewage contamination. *On storeage of roof water* he gives the following calculations:—

The quantity and quality of the water to be obtained from the roofs of buildings, when the covering is slate, has not been generally appreciated. Taking an ordinary middle-class house in a village, with stabling and outbuildings, the space of ground covered by the roofs will frequently reach 10 poles; while the space covered by a farm labourer's cottage and outbuilding will be 2½ poles. Assuming that the roof is slate, and the water dripping from it is properly caught by eave-troughing, and conducted by down pipes and impervious drain-pipes into a water-tight tank, sufficiently capacious to prevent overflow under any circumstances, and that by this method 20 inches of water from rain and dew is collected in the course of the year, the private house will have the command of 28,280 gallons, and the cottage 7070 gallons in a year. From such a supply an average daily quantity of 77⅘ gallons for the house, and 19⅗ gallons for the cottage will result. These respective quantities would not be sufficient for all purposes, but they would form a very good resource in the absence of a more copious supply. To secure them, however, it would be necessary to have tanks to hold half the year's amount, so as to provide against those extraordinary seasons of drought which occasionally take place, and which in the year 1868 extended over three months without any interruption. But a tank to hold even half the quantity obtainable from roofs would be considered so large and costly as only to be within the reach of the wealthy. A tank to hold 14,140 gallons would have to be 15 feet square and about 10 feet deep, while a tank for the cottage quantity of 3535 gallons would have to be 8 feet square and 9 feet deep. The cost would vary with locality; but the recent adoption of concrete for the walls of tanks would reduce the expense.

Mr. Denton next considers "water supply by public co-operation"—either by using a supply *above* the village by gravitation, or by raising water from below, or by "the use of a stream near at "hand, at a lower level than the village, as a motive power to raise "its own waters to the requisite height." Mr. Denton proposes to utilize the water drained from agricultural lands, where the flow is not constant, by storing the extra supply of the winter months in a reservoir.

Recourse must generally be had to comparatively shallow reservoirs, which are open to the objection that vegetable and animal life thrive in them, and when they decompose render the water less pure. This objection is, however, met by constructing the reservoir in such a manner as will allow of its being emptied every year and properly cleansed. The proportion of the rainfall discharged by under-drainage during the winter from clay lands will not be less than 3½ inches, where the annual rainfall does not exceed 24 inches, and the proportion due to the winter is not less than 9 out of the 24 inches. This amounts to 79,183 gallons per acre. To supply a village of 400 inhabitants with 10 gallons each per diem, a total quantity of 1,460,000 gallons will be required for the year's supply, half of which (730,000 gallons) must be stored during the discharging period for use during the remainder of the year, with an addition of 50 per cent. for evaporation, waste, &c. By this means a village may be amply supplied with water all the year round, the quantity used during the winter being supplied direct from the outlets, and that of the summer from the reservoir. A reservoir capable of holding the quantity required would occupy about 4-10ths of an acre, assuming the depth of water not to exceed 10 feet. The whole expense of constructing such a reservoir, with supply-pipes, would probably not exceed £400 (putting a fair value on the land required), which, if repaid with interest in thirty years, would involve an average annual charge upon each dwelling of about 8s. if 60 dwellings composed the village. This is rather lower than the minimum rate which it has been already stated the labouring cottager can fairly afford to pay.

To raise water lying beneath a village, where the quantity required is small, a chain and buckets may be employed—

a system in use at the time of the patriarch Abraham—so arranged that the buckets shall fill a reservoir, from which the inhabitants may be supplied by gravitation. "The "cost of a wind-engine with chain of pots, and tank to hold "16,000 gallons, with horse-power appliances under the tank, "would reach £750, or 15s. a head per annum in a village of "sixty cottages. For one hundred days in the year wind power "might be wanting, but the cessation would seldom be for more "than a fortnight. The tank would hold four days supply. The "wind-engine would work night as well as day, and a good horse "would in emergencies, working half a day, supply 4000 gallons. "Wind machines could also be supplied to centrifugal pumps. "To make use of a stream as a motive power, a ram must be "employed." These machines are fully described and illustrated by woodcuts, and the following estimate of relative cost:—

Hydraulic ram, working with a fall of 8 feet, and capable of raising daily to a height of 40 feet, and a distance of half a mile, 4000 gallons of the same water by which it is moved, with supply-pipe down village street, half a mile long, exclusive of connexions with the dwellings, &c.	£360	0	0
Turbine, working with a fall of 20 feet, and capable of raising daily 10,000 gallons of water (taken from the stream and filtered in its passage from thence to the pump-well) to a height of 100 feet, with pumps and rising-main for forcing the supply a distance of a mile, including supply-pipe down village street half a mile long, but excluding the connexions with dwellings	£660	0	0
Water-wheel, capable of doing the same work as turbine, but working with a fall of 3 feet only instead of 20, with pumps, rising-main, &c., exclusive of house connexions	£750	0	0

Circular to Gas Companies.

The Gas and Water Facilities Bill has been read a second time in the House of Lords, notwithstanding the adverse criticism of Lord Redesdale, who evidently prefers the old system of parliamentary legislation to the new system of provisional orders, but failed to induce his colleagues in the House to adopt his views. The Bill was to be considered in committee last night (June 20), and notice has been given by the Lord Privy Seal, who has charge of the Bill, of three amendments—two of which extend the provisions with respect to "companies, corporations, or persons," in the first and second sub-sections of clause 3, to "bodies of commis-"sioners," so bringing within the provisions of the Bill all possible owners of gas and water undertakings; and the other, by a proviso at the end of the same clause, proposes to give to any gas or water company empowered by Act of Parliament power to apply for, and avail themselves of, the facilities of the Act *within their own districts* respectively, by which means an existing incorporated gas or water company may obtain power to raise any additional capital it may require without an application to Parliament, or two or more gas or water companies may enter into an agreement to amalgamate their undertakings (the metropolitan companies always excepted) without having recourse to the same formality. The effect of this amendment will be, of course, to render unnecessary any further application to Parliament, on the part of any existing gas or water company, and to throw all legislation on these subjects on the Board of Trade, who, notwithstanding some hints of opposition, will no doubt be accepted as the "central authority" to have charge of these matters. The consequence will be that the Board of Trade will have to create a special gas and water department, if many of the companies choose to avail themselves of the facilities of the Act, which they probably will do, as the proceedings will be more economical than those under the parliamentary system. The change is great, and the results may reasonably be looked for with some doubt and anxiety. Looking back over the proceedings of parliamentary committees sitting on gas and water Bills, it must be admitted on all hands that the evidence brought before them has been well sifted and impartially judged, and that public interests have ever been paramount in the consideration of these tribunals. Whether the evidence brought before a commissioner or inspector of the Board of Trade will ever be so complete as that brought before a committee, and whether a single individual can exercise the same impartiality and independence as a committee of our legislators, are questions we shall not discuss; but we may be permitted to have our doubts whether the interests of the public will be so efficiently protected under the new as they have been under the present system.

The scheme for the amalgamation of the Great Central Gas Consumers Company with the Gaslight and Coke Company has been finally settled by the Board of Trade, and now only awaits confirmation by the Privy Council to become binding. It differs but little from that settled between the two companies (see page 231 of our present volume), and on the most important point the addition made is simply to give clear expression to the intention of the original scheme. The addition to which we allude is a proviso at the end of clause 21, by which it is settled that in balancing the revenue accounts of the amalgamating companies to the 1st of January, 1870, the revenue account of the Great Central Company shall be made up without reference to Mr. Higgs's abstractions. Thus the united company assumes the burden of these abstractions entirely. The accounts of the Great Central Company have been made up to the before-mentioned date, and it appears that the balance of profit which would have stood to the credit of the company on December 31, 1869, if these abstractions had not occurred, amounts to £56,290 19s. 5d.: and therefore, after paying the £15,000 for the purpose of division among the shareholders of the Great Central Company, the united company will have £41,290 19s. 5d. to carry to the credit of the defalcation account. It is still arranged that £5000 a year is to be set aside before payment of dividend, and carried to the credit of this account until it is fully discharged. But the important proviso has been introduced by the Board of Trade that, for the purposes of a revision of the scale of illuminating power and price, under the City of London Gas Act, 1868, these payments shall be deemed payments in respect of dividend. The only other alteration we need notice is that made in the maximum amounts payable to directors. The companies arranged that the amount the first year should be £6000, which was to be gradually diminished until, in the ninth and subsequent years, it stood at £4500. The Board of Trade have settled that, commencing as arranged at £6000, it shall gradually fall until, in the tenth and subsequent years, it stands at £3500. Although the remuneration of the directors is thus diminished, the number allowed is just the same. On all other points the scheme stands as arranged between the amalgamating companies.

The annual meeting of the British Association of Gas Managers, just over, has been in every way a success. The attendance was numerous, a large addition to the list of members was made, the communications listened to were of a useful, practical character, and the discussions good-humoured and to the point. A full report of the papers and discussions will, as usual, be found in this and subsequent numbers of our Journal. The President's address, though consisting for the most part of anticipatory notices of the papers to be read to the meeting, contained much useful information gained by personal experience, and will be read with much interest. The other communications will speak for themselves; but we must be permitted to make one or two suggestions. One is that considering the short time the members have at their disposal to listen to papers, the authors should condense their remarks into as short a space as possible, and treat only of what is essentially novel, taking it for granted that members possess an adequate knowledge of gas affairs in their existing state. It should also be borne in mind that the most valuable papers are those which provoke discussion, and elicit the opinions and experience of many members. Another suggestion we may make is that a separate meeting should be held for disposing of the business affairs of the Association. In this way more time might be given to the scientific objects of the meeting, and the reading of the papers would not be interrupted by discussions on proposed alterations in the bye-laws of the Association. The meeting was happily concluded by a visit to the Beckton works, where, after having had the opportunity of thoroughly inspecting what has been so far completed of the noblest gas establishment in the world, the members were hospitably entertained at a substantial luncheon, by F. J. Evans, Esq., the superintending engineer of the works. The members will find an admirable souvenir of this visit in the excellent photographs of the assembled group, taken by Mr. T. R. Wells, of Heath Street, Barking.

Correspondence.

THE SEWAGE QUESTION.

Sir,—I am sorry that I have not earlier seen your report of the discussion on Dr. Letheby's paper, published in your Journal of the 7th, or I shall have before corrected an error in your necessarily very imperfect report of my hasty remarks. No one will, I hope, suppose I did not believe any portion of Dr. Letheby's paper, for he never says anything much of which is not well worth serious attention. What I said was, it is impossible for any one to believe both of two contrary propositions stated in it, and that for my own part I believed neither of them. I did not believe that if so considerable a proportion of sewage as one-twentieth part of the natural stream is poured into a river supplying drinking water, such water is perfectly safe; nor that if the very much smaller proportion of sewage, after being purified to a very great extent by being used for irrigation, reaches a stream, its water will be highly dangerous. I am one of those who believe that part is less than the whole, and that if the whole contents of the sewers can be poured into a stream, and the fact of its being injurious can be disputed (and Dr. Letheby seems to deny it), I cannot understand how he can really apprehend increased danger from the part, and the very small part, that can possibly reach a stream from irrigated land. Neither water may be fit to drink; either source of supply is at the best suspicious; but that the *direct* pollution of a stream should be quite safe, and its *indirect* pollution highly dangerous, is not simply incorrect, but incredible.

There are other important errors in the paper, which I may take a future opportunity of correcting. P. H. Holland.

Park Cottage, Pelham Street, S.W., June 17, 1870.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JUNE 13, 1870.

The DUBLIN CORPORATION WATER Bill was read a second time, and committed.

The CLECKHEATON LOCAL BOARD Bill was returned from the Commons, with the amendments agreed to.

GAS AND WATER FACILITIES BILL.

The Earl of KIMBERLEY stated that this bill had been introduced in consequence of a representation made to the Board of Trade by gas and water companies that the facilities enjoyed by railways, piers, and harbours, of obtaining provisional orders, subject to confirmation by Parliament, should be extended to them. At present they had no power to break up roads for the purpose of laying down pipes, or to spend capital, without coming to Parliament. The Bill would enable the Board of Trade to grant them provisional orders, which, however, would give no compulsory powers, and would operate only in cases where all parties were agreed, the consent of the local authorities being required whenever roads were broken up. This would be a convenience for small companies unable to bear the expense of a private Act, and the provisional orders would be subject to the sanction of Parliament. He moved that the bill be read a second time.

Lord REDESDALE admitted that the plan proposed would be convenient to many parties, but remarked that the details of the bill would require a close scrutiny. The supply of gas and water being purely a question of local government, the power ought to be vested in the Home Office, especially as a sanitary commission was sitting on all local government bills.

The Duke of RICHMOND differed from the noble lord. Under existing Acts the Board of Trade were vested with authority over gas companies, and it was clearly the proper department to take the charge of this matter.

The Earl of KIMBERLEY also thought that with regard to gas the Board of Trade was the proper department. If the commission referred to by the noble lord should recommend the creation of some central authority with reference to sanitary questions, in which case fresh legislation would be necessary, water would naturally come within its jurisdiction, but at present it was desirable to place water companies under the Board of Trade, the Home Office being already overburdened with business.

The bill was then read a second time.

A petition was deposited against the ROTHERHAM AND KIMBERWORTH LOCAL BOARD OF HEALTH Bill, from owners, &c., of property within the district and others.

TUESDAY, JUNE 14.

The ROTHERHAM AND KIMBERWORTH LOCAL BOARD OF HEALTH Bill was read a second time, and committed.

The LEEDS CORPORATION GAS, &c., Bill was reported, with amendments.

THURSDAY, JUNE 16,

The SKIPTON WATER; the NEWCASTLE AND GATESHEAD WATER; the ENNISKILLEN BOROUGH IMPROVEMENT; the HALIFAX WATER, &c.; and the GASLIGHT AND COKE COMPANY'S Bills, were read a second time, and committed.

The CARDIFF GAS Bill was returned from the Commons agreed to, with amendmends. The said amendments considered, and agreed to.

FRIDAY, JUNE, 17.

The LEEDS CORPORATION GAS, &c., Bill was read a third time, with the amendments, passed, and sent to the Commons.

The GREAT CENTRAL GAS CONSUMERS and the READING LOCAL BOARD OF HEALTH Bills were referred to a select committee, to consist of Viscount Lifford (chairman), Earl Portarlington, Viscount Hood, Lord Foxford, and Lord Balinhard, who will sit on Tuesday, June 21, at eleven o'clock.

The BLACKBURN CORPORATION IMPROVEMENT; the ASHTON-UNDER-LYNE, STALYBRIDGE, AND DUNKINFIELD (DISTRICT) WATER; the OLDHAM CORPORATION WATER, &c.; and the ROTHERHAM AND KIMBERWORTH LOCAL BOARD OF HEALTH Bills, were referred to a select committee, to consist of Lord Walsingham, (chairman), Viscount Powerscourt, Lord Saltersford, Lord Dunsany, and Lord Heytesbury, who will sit on Tuesday, June 21, at eleven o'clock.

HOUSE OF COMMONS.

FRIDAY, JUNE 10, 1870.

The CLECKHEATON LOCAL BOARD Bill.—The Lords amendments were agreed to.

The CARDIFF GAS Bill, as amended, was considered.

TUESDAY, JUNE 14.

The CARDIFF GAS Bill was read a third time, and passed, with amendments.

A petition was deposited against the ST. HELEN'S GAS Bill, from the ratepayers and inhabitants of St. Helen's.

Legal Intelligence.

COURT OF CHANCERY.—THURSDAY, APRIL 21.

(*Before Vice-Chancellor Sir* W. JAMES.)

THE ATTORNEY-GENERAL *v.* THE WEST HARTLEPOOL IMPROVEMENT COMMISSIONERS.

Mr. C. E. KAY, Q.C., and Mr. BAGSHAWE appeared to support the information; Mr. AMPHLETT, Q.C., and Mr. KARSLAKE for the defendants.

This was an information at the relation of William Saddler, William Metcalf Meredith, and John Wood, ratepayers of the Improvement Commissioners district of West Hartlepool, whereby they sought to restrain the defendants from expending the rates and funds under their control in payment of the costs and expenses incurred or to be incurred by them in the promotion of a bill in Parliament, intituled, "A Bill for extending the limits of the district under the authority of the West Hartlepool Improvement Commissioners, and for making better provision for the improvement and government of the extended district, and for other purposes," and that the defendants should pay the costs of the suit, but not out of any rates levied or to be levied by them for the public purposes of the district.

The commission under which the defendants acted was established and its district defined by the West Hartlepool Improvement Act, 1854, which, among other things, enacted that the number of the commissioners should be twelve, and then, after reciting the various powers conferred on them, proceeded to state that "they (the commissioners) shall and may do all acts, matters, and things for promoting the health, comfort, and convenience of the inhabitants of the said town and township within the limits of this Act as they may deem or consider necessary, and for that purpose may exercise all the powers vested in them by this Act and the Acts incorporated herewith."

Subsequently to May, 1859, the commissioners adopted the Local Government Act, 1858, and became a local board under that Act.

In December, 1869, the defendants caused the bill now complained of to be introduced into Parliament, by which they sought to acquire additional powers, and to extend the Improvement Act, 1854, so as to comprise a further portion of the township of Stranton, and a portion of the township of Seaton Carew, and that they (the commissioners) should be authorized to borrow further sums for the purposes of this Act.

The commissioners incurred large expenses in promoting this bill in Parliament, and the relators, who were ratepayers of the district under the jurisdiction of the commissioners, ascertained for the first time on the 9th of March, 1870, that the defendants applied the rates levied by them under their statutory powers in payment of the costs incurred by them in the promotion of the bill, and the information charged that the commissioners intended to expend further sums of money in the promotion of the bill, and in paying the costs and expenses of certain opponents of the bill on the condition of their withdrawing their opposition to the measure. The relators stated that all the rates and funds under the control of the commissioners were applicable, pursuant to the Act under which they were levied, only to certain specific public purposes, of which the promotion of this bill was not one; that, therefore, the payment of these expenses out of the rates was unauthorized and illegal, and prejudicial to the interests of the ratepayers.

In support of the information, the case of the *Attorney-General v. Andrews* was cited, where, although it was admitted that the Act of Parliament for which the commissioners were applying would be very beneficial to the inhabitants of Southampton, an injunction was granted against the commissioners expending the money raised under an old Act in promoting a new one.

For the defendants it was submitted that in the cases cited the rates were for specific objects, and did not extend to promoting a bill through Parliament. In this case the new district is a nuisance to the old one. The Government inspectors reported that it would be better for both that there should be only one district, and it was not disputed that it would be for the benefit of the old town. The words of the Act were sufficient to authorize what had been done.

The VICE-CHANCELLOR: The Act does not authorize you to apply to Parliament for a bill. The commissioners cannot apply the rates to the promotion of a bill through Parliament. I am of opinion that this case is really governed by the cases of the *Attorney-General v. Andrews* and the *Attorney-General v. Eastlake*. It is impossible to draw, for any effectual purpose, any distinction between those cases and the present one. Mr. Amphlett has pressed upon me the words of the Act of Parliament, "And shall and may do all acts, matters, and things for promoting the health, comfort, and convenience of the inhabitants, and for that purpose may exercise all the powers vested in them by this Act." But it appears to me that, supposing this Act had been passed even years before those cases, it would be a very strained construction indeed upon those words, "the application of trust funds by trustees," to say that where trustees are to be surveyors of the highways, to do acts, matters, and things for promoting the health, comfort, and convenience of the inhabitants, and to exercise certain powers given in certain cases for that purpose, that that would imply that they were to do all acts, matters, and things, including, if necessary, the application to Parliament for an enlargement or alteration of the powers thereby assigned to them. I mean if this had taken place before those cases; but of course one must read this with the light of those cases at the time the Act was passed, and at the time this Act was passed the Legislature, I presume, knew—at least, all parties must be supposed to have known—that those cases had decided that as a general rule these bodies were not authorized to apply to Parliament for new Acts of Parliament—to apply, that is, in the sense of using the trust funds entrusted to them for that purpose. If it had been meant to have given them that power with regard to those decisions, the proper course would have been to have followed the advice given by Vice-Chancellor Wood, and had those words put into the Act of Parliament, as he said in the *Attorney-General v. Eastlake*, "including, if necessary, the power of applying to Parliament." That was the answer which he gave to an argument of mine, which I thought was a *reductio ad absurdum* of the old cases. I said if there was a slip in the Act of Parliament they could not go and remedy that. He admitted that would be the result of the decisions; they could not have gone to Parliament to remove the slip. Then I am bound to say that, upon consideration of these things, I do not entertain any doubt that the decisions in the cases are very wholesome; because one cannot but feel that if there were an unlimited power for bodies of this kind to apply whenever they thought fit to Parliament at the expense of their constituents, one can easily see there would be a great deal of that kind of professional business got up which would be done at the expense of the ratepayers; and it is much better, as it seems to me, that persons who do seek to obtain parliamentary powers should do it at the risk of satisfying Parliament it is right; and when they satisfy Parliament it is right, Parliament always takes care to provide them with the funds for having done that which is right. Therefore I do not wish to be understood as throwing the slightest doubt upon the propriety of the decisions in these cases. Mr. Amphlett suggested that there are powers here of applying to the Court of Quarter Sessions, and I presume there would be the power of applying to have the rate quashed. I presume they could go to the Court of Queen's Bench by *certiorari*, if necessary, to restrain an illegal act. But the insufficiency of those remedies seems to me to be abundantly demonstrated by what has taken place here, because, having no power to levy a rate except for certain purposes which are to be specified beforehand, and there having been no estimate and no specification of any expenditure to be incurred in applying to Parliament, some one or other of these persons has been able to make an expenditure of upwards of £600 for the very purpose of this Act of Parliament. It seems to me that that shows the necessity of applying to this court, and of the court retaining jurisdiction, which I think it can quite as satisfactorily exercise as the Court of Quarter Sessions would be able to do. Therefore the injunction will be as prayed.

THURSDAY, JUNE 9.

(*Before the* LORD CHANCELLOR *and Lord Justice* GIFFARD.)

THE ATTORNEY-GENERAL *v.* THE MAYOR, ALDERMEN, AND BURGESSES OF THE BOROUGH OF LEEDS.

This was an appeal from a decree of Vice-Chancellor James, restraining the defendants, the Corporation of Leeds, by an immediate injunction, from opening any further communications with the existing outfall into the river Aire, and, from and after the last day of the parliamentary session of 1871, from pouring out any sewage by the present outfalls in an unpurified state. It appeared from the information, which was filed at the relation of two owners of land on the banks of the river Aire, below the town of Leeds, for the purpose of restraining the corporation from polluting the river, that in 1842 an Act was passed for better lighting, cleansing, sewering, and improving the borough of Leeds (the Leeds Improvement Act, 1842), which contained powers to construct common sewers and bring the private drains into communication with them. Nothing very material was done under this Act, and in 1848 a further Act was obtained by the corporation, called the Leeds Improvement Amendment Act, 1848. By this Act it was provided (section 3) that such of the clauses of the Towns Improvement Clauses Act, 1847, as related to the making and maintaining the public sewers and to the drainage of houses "shall be incorporated with this Act, and that such clauses, except so far as they or any of them are inconsistent with the provisions of this Act, or are expressly varied or excepted by this Act, shall form part thereof." Sections 6 and 7, which were material, were as follows:—"6. And be it enacted that the several townships of Leeds, Hunslet, and Holbech, in the borough of Leeds, shall be one drainage district, and it shall be lawful for the council to construct one main trunk and other sewer or sewers sufficiently capacious to receive the foul and drainage water and filth of all the said three townships, and to convey the same into the river Aire. 7. And be it enacted that it shall be lawful for the council to unite the several other townships within the borough, or so much and such parts thereof respectively

as the council shall think fit, into one or more drainage district or districts, and to construct one or more main trunk or other sewer or sewers for the purpose of receiving the foul and drainage water and filth of each such district." Under the powers of section 6 the corporation, in 1850, commenced a system of sewerage for the townships of Leeds, Hunslet, and Holbech, with an outfall into the river Aire. This outfall was opened in 1853, and since then communication had from time to time been made with the main trunk sewer, and so into the outfall, the outlay upon the work having been £207,355. The borough of Leeds occupies an area of 34 square miles, with a population of about 250,000, and the population of the townships of Leeds, Hunslet, and Holbech, which is greatly on the increase, now amounts to 180,000 and upwards. In 1866 the corporation formed a second drainage district, known as St. John's, and containing 2400 houses, with a population of about 12,000, and the drainage from the houses in this new district was being conveyed into the Aire. The defendants had recently formed a third drainage district, including several very populous townships, and were proceeding to construct sewers and convey the sewage into the river. The result of these drainage operations, it was stated, in the usual terms, had converted the river from a comparatively pure and wholesome stream into an open sewer, wholly unfit for the use of cattle or human beings, too foul for fish to live therein, with an offensive stench injurious to health, and, in fact, constituting a serious public nuisance. A meeting of the principal residents and landowners was held in August, 1869, at which resolutions were passed calling attention to the serious nuisance created by the drainage operations of the corporation, and urging the necessity of immediate action for restraining any further extension of the mischief, and obviating the existing nuisance. No satisfactory steps having been taken by the corporation, the present information was filed in November last, and now came on for hearing. There was no great conflict of evidence in the case. It was admitted on all hands that the river Aire was in a very polluted state, but it was suggested on behalf of the corporation that this state of things arose from causes over which the corporation had no control. In particular it was stated that the Aire was a foul and polluted stream long before it reached Leeds, inasmuch as it received the whole drainage of the very populous manufacturing district (including the towns of Skipton, Keighley, Bingley, Shipley, and Bradford) situate between its rise at Malham Cove and Leeds, a distance of 45 miles. The main argument, however, turned upon the powers given to the corporation by their Act of 1848 to pour their sewage into the river. The case made in support of the information was that the powers contained in section 6 of the Act of 1848 were wholly subject to and governed by the incorporated provisions of the Towns Improvement Clauses Act, 1847, by which it is provided (section 24) that sewers shall be made, "but so that the same shall in no case become a nuisance;" and again (section 107), that nothing in the Act shall render lawful anything which would be deemed a nuisance at common law, or exempt any person guilty of nuisance at common law from prosecution or action in respect thereof. For the corporation it was contended that the express power given by section 6 was in no way limited by the general provisions of the Towns Improvement Act. The provision contained in section 24, that sewers were to be made so as in no case to become a nuisance was altogether inconsistent with the express power contained in section 6, and, therefore, was not incorporated with the Act of 1848. It was also maintained that where a public body is empowered by Parliament to carry out a certain work, everything incident to that work (even the creation of a nuisance, as in the case of a sewer) was authorized, unless there were express restraining words, which in this case there were not. It was also submitted that there was not sufficient evidence of injury to public health, and that, even assuming a nuisance to exist, the court must regard the balance of convenience and inconvenience, and would not, by granting an injunction and stopping the outfall, endanger the health of a population of 250,000, while only some few persons living below the town would suffer inconvenience or injury by the continuance of the present system of drainage. The Vice-Chancellor being of opinion that the case raised by the information was fully made out, and that the contention put forward by the corporation—viz., that they were entitled by the terms of their special Act to pour the sewage of Leeds into the river Aire, wholly irrespective of and uncontrolled by any considerations of nuisance to the inhabitants, could not be maintained, granted an immediate injunction against opening any further communications with the existing outfall, and an injunction, from and after the last day of the parliamentary session of 1871 (so as to give the defendants time to apply to Parliament), against pouring out sewage by the present outfalls unless and until the same should have been purified and deodorized.

The corporation appealed from this decree.

Mr. JESSEL, Q.C., Mr. FRY, Q.C., and Mr. GRAHAM HASTINGS appeared in support of the appeal; Sir ROUNDELL PALMER, Q.C., Mr. KAY, Q.C., and Mr. CHARLES HALL, for the informant and relators, were stopped.

Their LORDSHIPS were of opinion that the order of the Vice-Chancellor was right, and that the corporation had no power to execute the works in question so as to create a nuisance. The main contest on the part of the defendants was that section 107 of the Towns Clauses Improvement Act (prohibiting the creation of any nuisance in carrying out the powers of making drains and sewers thereby authorized) was not incorporated in the Leeds Improvement Act, 1848, so as in any way to fetter the powers thereby given. But in taking the powers of the general Act, and professing to act under them, the corporation were not entitled to select and take those powers which were necessary for carrying out the works in question, and to exclude the general clause which fettered and overrode those powers. Whatever powers, therefore, were incorporated into the special from the general Act were subject to section 107, and did not authorize the works to be executed so as to occasion any nuisance. Nor was there any original power under the special Act for carrying out these works unfettered by any considerations of nuisance, and independently of the powers of the general Act. It was then said that according to the special Act the clauses of the Towns Improvement Act, 1847, as to making and maintaining the public sewers, and as to the drainage of houses, were to be incorporated only so far as they were not inconsistent with the provisions of the special Act, and that as it was impossible to drain into the Aire without creating a nuisance, the provisions of the general Act were inconsistent with the powers of the special Act, and therefore were not incorporated. But that remark would apply equally to the drainage clauses of the general Act, which were all guarded by the proviso that they were to be so exercised as that the same should in no case become a nuisance. The works, then, must be carried out subject to the provisions of the general Act, and the corporation had no power to commit any nuisance. With regard to delay, it was quite obvious that where parliamentary powers were given every one was bound to assume, until the contrary had been clearly shown, that those powers would be properly carried out; and the simple fact of forbearing for a certain time to interfere had not barred the right of the relators to interfere, and was not such an amount of *laches* as to lead the court to say that the evil ought not now to be arrested. The conclusions of the Vice-Chancellor were, in their lordships opinions, right, and the decree would, therefore, be affirmed.

(*Before Vice-Chancellor Sir* R. MALINS.)

THURSDAY, JUNE 9.

DALZIEL *v.* THE RAILWAY CARRIAGE AND STEAMBOAT GAS LIGHTING COMPANY.

This was a motion on behalf of the plaintiff, who is the patentee of an invention for an "improved apparatus for regulating the pressure and supply of gases or elastic fluids," for an injunction to restrain the defendants, who are the owners of Messrs. Dering and Newall's patents for lighting railway carriages with gas, from writing, printing, or publishing, issuing or circulating any circulars or advertisements whereby the property of the plaintiff or his business may be damnified or injured, or whereby any persons may be deterred, intimidated, or hindered from purchasing or using the plaintiff's apparatus, or from becoming customers of the plaintiff in respect thereof. The bill alleged that the defendants, who, it was admitted, were also holders of patents for lighting railway carriages, had issued circulars alleging that they were the holders of the only patents for lighting railway carriages with gas, and cautioning all railway companies and the public generally against the use or application of gas for this purpose by means of any apparatus not supplied by the defendants, as legal proceedings would be taken in every case of infringement.

Mr. MACKESON, Q.C., and Mr. WELLINGTON COOPER appeared in support of the motion, and submitted that this case was similar to that of *Dixon v Holden* (Law Rep., 7, Eq., 488), in which this court had decided that it had jurisdiction to restrain the publication of any document tending to the destruction of property, whether consisting of money or of professional reputation, by which property was acquired.

Mr. COTTON, Q.C., and Mr. CHARLES HALL appeared for the defendants, and read affidavits to show that the plaintiff had also issued circulars and advertisements which, by vaunting his own invention, were calculated to injure the business of the defendants quite as much as their circulars would injure the plaintiff. It was intended by the defendants to take legal proceedings for trying the validity of the plaintiff's patent, but they declined to give any undertaking as to the time or nature of those proceedings.

After some discussion, an order was made that the motion should stand over till the hearing of the cause, the plaintiff and defendants respectively undertaking to withdraw all passages from their circulars and advertisements referring to the patents of the others.

COURT OF EXCHEQUER.—WESTMINSTER, THURSDAY, JUNE 9.

(*Sittings in Banco, before the* LORD CHIEF BARON, *Baron* MARTIN, *Baron* CHANNELL, *and Baron* CLEASBY.)

KREHL *v.* GREAT CENTRAL GAS COMPANY.

This was an action of trespass brought by the assignees of the well-known Benjamin Higgs, formerly a collector in the employment of the defendant company, to try the title to certain property which had been in Higgs's possession in his house at Twickenham. The plaintiffs claimed as assignees under his bankruptcy. The defendants claimed by virtue of a deed made in 1854, by which Higgs granted authority to a guarantee society to enter upon his premises and seize any goods there to the extent of £500 in case of default by him as collector for the gas company. The plea set out this deed, and went on to allege that after Higgs had committed an act of bankruptcy, though without notice of it, and before adjudication, the defendants, acting under the authority of the guarantee company, seized the goods in question.

This plea was demurred to. The sole question in dispute upon demurrer was whether such a seizure was a "transaction" within the meaning of section 133 of the Bankruptcy Act, 1849, so as to fall within the protection given by that section to *bonâ fide* transactions with bankrupts after the committal of an act of bankruptcy.

Mr. DAY and Mr. E. HOLLAND supported the demurrer; Sir JOHN KARSLAKE, Q.C., and (Mr. WATKIN WILLIAMS appeared for the defendants.

The COURT held that the seizure was a transaction within the meaning of the section, and gave judgment for the defendants accordingly.

Miscellaneous News.

CHARTERED GASLIGHT AND COKE COMPANY.

An Extraordinary General Meeting of the Shareholders of this Company was held at the Offices, Horseferry Road, Westminster, on Tuesday, June 14—the Hon. RICHARD HOWE BROWNE, deputy-governor, in the chair—to consider and approve a bill now before the House of Lords, entitled "An Act to enable the Gaslight and Coke Company to purchase the undertaking of the Victoria Docks Gas Company, and for other purposes."

The SECRETARY (Mr. J. O. Phillips) having read the notice convening the meeting,

The DEPUTY-GOVERNOR said the directors were very sorry to have to call the shareholders together again so soon, but the Standing Orders of the House of Lords required that the formal sanction of the proprietors should be given to the bill prior to its second reading in their lordships House. The bill practically was the same as that which on a former occasion was unanimously approved of, but two or three minor alterations had been made which would be pointed out as the secretary read the clauses. He was happy to state that the time for petitioning against the bill had elapsed, and no petition had been presented, so that the bill would go to Lord Redesdale as an unopposed bill, and no further expense to the company would be involved.

The SECRETARY read the heads of the clauses of the bill. In the clause which authorizes the company to supply gas in bulk to other companies, a provision has been inserted limiting the company to the outside of the metropolis for laying down pipes for that purpose. A clause has been introduced at the instance of the West Ham Local Board, as the price of the withdrawal of their opposition, fixing the charge for gas supplied to the public lamps in the Victoria Docks Gas Company's district at the lowest price for the time being charged to any private consumer. A clause has also been introduced at the instance of the Metropolitan Board of Works, enabling the company to discontinue the manufacture of cannel gas. By the Metropolis Gas Act, 1860, there was a power to change the supply from cannel to common gas coal on giving three months notice, but that power was repealed by the Act of 1868. These are the principal changes in the bill.

The DEPUTY-GOVERNOR moved—"That the bill now read to this meeting be approved."

Mr. GRAY seconded the motion.

Mr. LAVANCHY, without wishing to offer any objection to the bill, expressed regret that the shareholders could not have been made acquainted with its provisions before being called upon on the mere reading of the clauses to give their assent to it. He also thought that the hour fixed for holding the meetings (eleven o'clock) was very inconvenient for many of the shareholders.

The DEPUTY-GOVERNOR said, there being upwards of 2000 shareholders in the company, it would have been a considerable expense to supply each shareholder with a copy of the bill, and such a proceeding would have been altogether unusual. The reason for holding the meeting at that early hour was that the examiner sat at noon, and the bill must be presented to him approved by that time.

The resolution was then put and carried unanimously, and a vote of thanks having been given to the chairman, the proceedings terminated.

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.

An Ordinary General Meeting of the Shareholders of this Company was held at the London Tavern, Bishopsgate Street, on Tuesday, the 7th inst.—WILLIAM NICOL, Esq., in the chair.

The SECRETARY (Mr. E. P. Rowsell) having read the advertisement convening the meeting, the following report and statement of accounts were presented:—

The directors beg to present the balance-sheet and accounts for the year ended the 31st of March last. It will be seen that the profit and loss account is of a satisfactory character.

The directors recommend the addition of £300 to the reserve-fund, that £386 0s. 1d. be paid off preliminary and other expenses, and that the usual dividend be declared of 7 per cent. on the preference shares, and a dividend of 4½ per cent., free of income-tax, on the ordinary shares.

The works at the several stations are in good condition, and no accidents have occurred.

The directors retain the favourable opinion of the future of the company which they held at the date of the last report.

The retiring directors are Robinson Duckworth, Esq., and John Romanes, Esq., who, being eligible, offer themselves for re-election.

The auditors, Henry M'Lauchlan Backler, Esq., and James Le Geyt Daniell, Esq., likewise retire, and, being eligible, likewise offer themselves for re-election.

General Balance-Sheet, March 31, 1870.

Dr.					*Cr.*		
To Capital—				By Preliminary expenses (balance)		£1,456	16 9
£5 per share on 15,000 ordinary shares	£75,000	0 0		Outlay at the stations		120,961	8 2
Less discount on shares authorized, 1868	3,000	0 0		Sundry accounts (balance)		859	4 5
	£72,000	0 0		Deficiency in stock account (balance)		108	7 8
£5 per share on 6000 preference shares	30,000	0 0		Suspense accounts		525	13 7
		£102,000	0 0	Furniture, London office		94	15 1
Loans on debentures		33,400	0 0	Goods in transit		634	10 1
Bills payable		3,562	14 10	Sundry debtors		7,009	17 9
Sundry creditors		2,363	12 4	Bills receivable		803	14 3
Reserve-fund		905	18 9	Stocks		11,955	10 6
General revenue account		4,806	17 1	Cash		2,629	4 9
		£147,039	3 0			£147,039	3 0

Profit and Loss, for the Year ending March 31, 1870.

Dr.				*Cr.*			
To Coal	£5,665	15 9		By Gas	£17,498	10 2	
Gas-making (salaries and wages)	1,888	13 4		Coke	2,444	12 7	
Charges on street lights	968	1 6		Tar	61	11 2	
Wear and tear	858	10 7		Rental of meters	362	10 5	
Lime and purifying	103	5 3		Meters	85	10 10	
Rents	66	19 4		Stock	86	9 5	
General expenses	971	16 7				£20,539	4 7
		£10,323	2 4	Profit on fittings	£41	5 4	
Fines, allowances, and bad debts	£80	1 4		Ditto on special work	301	4 2	
Deficiency in stock account (second instalment)	150	0 0				342	9 6
Deficiency in stock during the year	43	12 4		Transfer fees		3	8 6
		273	13 8				
Preliminary expenses and sundry accounts, instalments of		386	0 1				
London expenses		1,076	11 7				
Exchange		284	12 5				
Interest on debentures	£1,992	18 5					
Interest and discount	199	14 9					
Interest on calls in advance	36	15 10					
		2,229	9 0				
Income-tax (balance)		16	5 7				
General revenue account		6,095	7 11				
		£20,885	2 7			£20,885	2 7

General Revenue Account.

Dr.				*Cr.*			
To Dividend account—				By Balance from last account (after payment of dividends)		£61	9 2
Payment on account on preference shares, in December, 1869	£1,050	0 0		Profit and loss		6,095	7 11
Reserve-fund	300	0 0					
Balance (for dividend)	4,806	17 1					
	£6,156	17 1				£6,156	17 1

The Chairman, in moving the adoption of the report, said: I will simply address to you a few words on the general affairs of the company. Since we met at this time last year, few events have occurred to call for observation. In fact, we have gone on so steadily and smoothly, that there is not an event of consequence to lay before you. We have had the good fortune to escape from disasters of every kind. The works have gone on, or rather they have carried themselves on, very gently and very smoothly ever since we met last year, and no accident of any kind has occurred to mar our success. We refrained from calling you together last autumn, because we had really nothing, or almost nothing, to communicate to you. You are aware, no doubt, that the consumption of gas in the towns in the Mediterranean is very much smaller in summer than it is during any other time of the year. We are very much dependent on the lighting of shops and public buildings. The public generally close their shops as soon as it is dark; at all events, that is the case during a considerable portion of the summer, and therefore they require less gas. If we had, at that time, undertaken to recommend a dividend, it must have been exceedingly small, from the circumstance that so little gas had been used during the previous six months. I am glad to say, however, that during the last six months we have got on much better; the consumption has, to a certain extent, increased, and we have had no drawback to our general prosperity. We have been able to pay off some accounts that were rather unsightly; for instance, a portion of our preliminary expenses, and some other accounts, and to add to our surplus fund the sum of £300, making the amount in hand £900. Altogether, the affairs of the company look better than they did. I am glad to say we are able to propose to you a better dividend than you had last year, and I hope you will be satisfied with what we have been doing. I will now proceed briefly to compare some of the leading accounts of this year with those presented to you at our last meeting. In the first place, you will observe that our capital is £102,000, including the amount that was last raised on 6000 preference shares. The loans on debentures are £33,400, or £400 more than last year. We take the opportunity, when we can, of paying accounts in debentures, it being more convenient than paying in cash. The bills payable are smaller than they were at this time last year. Then they were £4087; now they are £3562. We have been paying off some of our creditors, odds and ends, and other things that were hanging over, and which it was well for us to clear off. The reserve-fund is £905, against £600 last year. The general revenue is considerably more now. Last year it was £4423; at present it is £6157. The preliminary expenses have been reduced from £1614 to £1456. It was arranged that we should pay off the whole of those preliminary expenses in seven annual instalments, and we have continued to reduce it gradually. The expenditure at our stations is perhaps about £4000 more than last year, but that arises chiefly from the extension of our works, particularly at Malta, and the completion of some of the works at Marsala and Trapani. However, the expenditure is a repaying one, I am glad to say. I do not know there is anything more in the accounts about which you care to be informed, but I shall be glad to answer any questions you may choose to put. With reference to our affairs generally, I must say there is a marked improvement over last year, Malta maintaining its ground well; No. 1 station particularly, and No. 2 is also improving—I mean the one across the great harbour, which was undertaken much later than the previous one. Marsala and Trapani, like the kingdom to which they belong, have scarcely got settled yet. We are paying full interest upon the debentures by which the works at those places were created; all the interest you have during the last year paid in full. As you are aware, the person who undertook them, the contractor, for the first year consented to receive 2 per cent. instead of full debenture rate, but of course during the last year the full amount has had to be paid, and we have paid it. There is a small profit, I am glad to say; and the use of petroleum, which was a great drawback to our success, has diminished. The shopkeepers find that it is not so cheap as gas, and we do not hear of any increase in its consumption. We know that several of our consumers have returned to the use of gas, and have given up the consumption of petroleum, and we hope to hear a little more of that kind of news by-and-by. I am glad to say, too, there is a considerable improvement at Corfu. It has been very unfavourably looked upon from an English point of view. The change from the English possession to the Greek has not been viewed with favour, and I confess that I rather joined in the general opinion at one time, and thought it would have been better if we had had nothing to do with it. But Corfu is coming round, and the station is yielding a much better return than it was. The country generally, as you are aware, is far from being in a satisfactory state; but that happily does not affect Corfu. I am glad to observe by the newspapers that the King and Queen of Greece are going to reside at Corfu during the summer months, and of course there will be a greater consumption of gas than ever there has been. This is a matter in our favour; and I look forward to that station more hopefully than I have done before. I now move—"That the report of the directors now read, together with the balance-sheet, be received and adopted."

Mr. Rhodes seconded the motion.

Mr. Hodgson Jones, in reply to several inquiries, said that the stocks of coke were very low now at the stations generally. They had not been troubled with the sale of their coke this year as last. As to fines, they had a general accumulation, owing to disputes running over two or three years, but which now came into the accounts of this year, and they arose chiefly from the public lights not consuming the amount of gas that they ought to have done. There had been no fines for improper gas, gas deficient in lighting power, or for impure gas, inflicted on any of their stations. He did not think the item was a large one. With respect to "deficiency in stock," that was a matter occurring in most companies from time to time. It was impossible to work out their stocks of coals exactly to the quantity entered in the returns. The returns showed that the stocks were very small. One cause of deficiency had been explained at a former meeting. It arose, he believed, at the starting of some of their stations. The stocks were taken every year by independent persons, and not by officers of the company, so that the return might with safety be relied on.

The Chairman must join with Mr. Rhodes in condemning the charge for fines, it being most unsatisfactory; but, as Mr. Jones had explained, there appeared to be an accumulation of fines, extending over two or three years, owing to differences in the lighting power of their gas.

Mr. Hodgson Jones said that the fines were imposed because some of the public lamps did not burn a sufficient quantity of gas; little matters of that sort occurring in many companies besides theirs. As every one acquainted with foreign companies must be aware, the imposition of fines was rather a good thing than otherwise, because they tended to keep their servants in order.

Mr. Rhodes: I suppose you have some person at the station to test the gas?

Mr. Jones said there was a public tester in each town.

The report was then unanimously adopted.

On the motion of the Chairman, a dividend at the rate of 7 per cent. per annum was declared upon the preference shares, and a dividend at the rate of 4½ per cent. per annum on the ordinary shares, free of income-tax.

The retiring directors and auditors were re-elected, and

Mr. H. M'L. Backler, in returning thanks on his re-appointment as auditor, said that he could confirm what their chairman had told the meeting with respect to the prospects of their undertaking. He had gone carefully through the accounts and all matters relating to the affairs of the company, the secretary having kindly put everything in his way for that purpose. The outlay at the present time was somewhat large for the business done, but that, as they stood, should be a matter of comfort rather than one of discouragement, because that outlay could not fail to be remunerative in the course of time. As regarded the competition of petroleum, he did not think there was much in that, because petroleum must give way to gas ultimately, as oil lighting had done in other countries. He thought the outlay, compared with the small amount of profit derived from the works at present, must give such a return in the course of time as would materially increase the dividends of the company. Experience in other undertakings made that a matter of certainty. Perhaps he might be allowed to make a few remarks with regard to fines, which was a matter of but small importance indeed. As Mr. Jones had said, fines were really a check upon their servants; it showed that the authorities looked after them, so that when fines were only occasionally inflicted, the shareholders might be sure that their servants were doing their duty; whereas, if left to themselves, it might be found that the authorities would come upon the company and seek to recover a heavy amount, which might have to be paid, owing to a want of caution. At any rate, when gas stations were situated at a distance from the managing board, it was necessary that some one should look after their servants, and fine them if they did not do their duty. With respect to deficiency of stock, it was impossible to say exactly what quantities they had in hand at the end of the year. When they considered the amount of manipulation with regard to coal, coke, and other things, it was not right to impute blame upon the manage-

ment with respect to that. They had been exceedingly particular in putting everything down in the clearest possible manner, from the commencement to the present period of the concern. As to "preliminary expenses," they would find that such an item was included in the accounts of most companies—such sums as had been expended in the establishment of the concern being charged to capital. They (the Malta Company) did not do that; they thought it best to return it as a separate item, and when they became prosperous to write it off entirely. If they went on prospering as they had done, in seven years such a desirable event would have occurred, and the capital be so much less than it had been. With these observations he begged to thank the meeting, on behalf of himself and colleague, for the mark of confidence again extended to them.

The CHAIRMAN thanked Mr. Backler for the clear manner in which he had explained those things which had fallen under his observation.

Mr. RHODES moved a vote of thanks to the chairman and directors for the attention they had paid to the affairs of the company during the past year.

Mr. GARNER seconded the motion, which was carried unanimously.

The CHAIRMAN acknowledged the vote on behalf of himself and brother directors. If they could not promise to give greater attention than they had to the affairs of the company, they could at all events in all sincerity say that no schemes should be brought before the shareholders to alarm them as had been the case some time ago.

A vote of thanks to the auditors was then adopted.

Mr. GARNER said they could not possibly separate without thanking their secretary and the officers of the company for the very admirable manner in which they had carried out the wishes of the directors and shareholders during the past year.

Mr. RHODES seconded the motion, which was carried unanimously.

Mr. ROWSELL, in acknowledging the vote, said that no officer was better pleased with a satisfactory working of a company than the secretary. It was a most disagreeable position to occupy when an unfavourable report was to be presented. He was glad to say that their company was in a most favourable position this year. Their expenses could scarcely be greater than they had been either at the different stations or in London, whereas only one of their stations was fully developed. All the rest admitted of very considerable improvement. When they came to think that the whole of the improvements must tell upon the ordinary shares, seeing that the rate of interest paid upon the debentures and preference shares was a fixed one, they would perceive what a totally different position their ordinary shares were likely to occupy in the course of three or four years from this time, when he thought they might thoroughly rely upon a dividend ranging from 8 to 10 per cent.

EUROPEAN GAS COMPANY, LIMITED.

An Extraordinary General Meeting of the Shareholders of this Company was held at the Office, 11, Austin Friars, on Wednesday, the 8th inst., for the purpose of repealing, altering, or amending some of the clauses of the company's regulations, and adopting and enacting new clauses or regulations in their place. W. WHITE, Esq., the chairman of the company, presided.

The SECRETARY (Mr. H. M'L. Backler) having read the notice convening the meeting,

The CHAIRMAN said: Gentlemen, the position of this company has been so completely altered of late years, since the present regulations were adopted, that the board have considered it right, and wisely I think, to draw your attention to it, and to lay before you certain alterations which we believe will be for the benefit of the company. Some years ago there was a question raised amongst the shareholders about drawing the shares, and there is a clause in the deed which is considered to be an improper one, looking at things as they now are. We propose, therefore, that that clause shall be amended, as also other clauses which will be laid before you. The forethought which your directors have taken in all matters has led them to the conclusion that the alterations they suggest will be for the benefit of the shareholders, and if it is your wish that these things shall be put before you *seriatim*, I will do so, but if there is no objection I will take them together so as to save time. If any shareholder has any objections to any of these clauses, perhaps he will be kind enough to state them at once, so that I may take the sense of the meeting upon them.

Mr. W. SMITH thought that if any discussion was likely to take place upon the new clauses, they had better be proposed *seriatim* and separately. There was only one with respect to which he felt any concern—namely, that which related to voting, or the appropriation of the votes.

Mr. W. J. LEWIS considered it would be a waste of time for the chairman to put the clauses separately before the meeting, inasmuch as many of them contained merely verbal alterations. Probably gentlemen would say at once whether there were any clauses to which they meant to object.

Mr. W. SMITH said he did not object to the new clause, but merely wished to hear a little discussion upon it.

Mr. LOVEJOY said that he should like to ask a question or two with respect to some of the clauses. The alteration in No. 7 clause affected all the shareholders, but there was no amount of interest mentioned. He thought it ought to be stated definitely what sum it would be deemed proper for the shareholders to pay. It might be 5, 10, or any per cent. which the directors should think proper, but whatever it was to be it should be stated in the clause. He always liked to know what he had to pay when he undertook any responsibility, and he felt sure that the suggestion he had thrown out would be for the benefit of the company.

The CHAIRMAN said the honourable shareholders should hope it would be 10, 15, or 20 per cent., because it would be regulated entirely by the dividends which were paid to the shareholders. The directors thought that it was not fair to charge a man 5 per cent. only when he did not pay his calls, and when perhaps he was getting his 10 per cent. dividend. They only wished to make the interest charged consistent with the sums they had to pay.

Mr. LOVEJOY thought that a man should not be allowed any dividend when he was a defaulter by not having paid his calls.

The CHAIRMAN said they were obliged to put the dividends to the credit of a man's account.

Mr. LOVEJOY would suggest that interest should be charged at a rate not exceeding 5 per cent., which was a reasonable amount for people to pay. It was better to let shareholders off easily than to put an extreme pressure upon them.

The CHAIRMAN said that the equity of the case was clear. If a man received his 10 per cent. dividend he ought not to withhold his calls at 5 per cent.

Mr. LOVEJOY said that, supposing a man had not complied with the rules of the company by paying the calls which were due from him, he was a defaulter, and, in his opinion, ought not to be entitled to receive his dividend.

The CHAIRMAN intimated that the company could not help it. They were obliged to give such a man credit, and charge him with the interests in his account.

Mr. W. T. FAWCETT (a director) said that no doubt interest ought to be charged at the same rate as the dividend, but he thought it was a matter which might safely be left to the discretion of the board.

The CHAIRMAN then proceeded with the several clauses, which he proposed *seriatim*. He moved that clause 7, which, as it previously stood, rendered every shareholder who did not pay the amount of any call liable to pay interest for the same at the rate of 5 per cent. per annum, from the day appointed for the payment thereof to the time of the actual payment, be repealed. In lieu of this the following clause was submitted:—"If, before or on the day appointed for payment, any shareholder shall not pay the amount of any call to which he is or shall be liable, then such shareholder shall be liable to pay interest for the same, from the day of such default to the day on which he shall pay the same, at such rate of interest as the board of directors shall from time to time determine."

Mr. FAWCETT seconded the motion, which was unanimously adopted.

The CHAIRMAN then proposed the substitution of the following for clause 10:—"The board of directors may refuse their assent to any transfer of shares that may be tendered or proposed to them, but if they do not declare such refusal by notice in writing, to be signed by the secretary or some other officer of the company, and to be transmitted by post to the transferor and proposed transferee within one week of the receipt of the proposed transfer, they shall be deemed to have assented to the same, and shall cause the deed of transfer to be acknowledged and registered accordingly. If the board of directors dissent from or refuse their assent to the proposed transfer, the matter or question of the receiving and registering such transfer shall be referred to arbitration in manner provided by the 107th section of the company's regulations, provided the transferor shall, within ten days from notice of such refusal, so require, by notice in writing, to be served on the secretary or any clerk at and in the offices of the company." The old clauses, 10 and 11, stated that no share should be transferred except in accordance with certain regulations; but any holder who proposed to transfer his share should serve notice of such proposal on the company in writing, specifying the shares to be transferred, with the name, place of abode, and calling or profession of the transferee. The directors, within ten days from the service of the notice, were to declare their assent to or dissent from the transfer, such dissent being conclusive as respected the first and second proposal, but if a third proposal was dissented from, then the proposer could refer the matter to arbitration.

Mr. HUGGINS asked if there was any necessity for this clause. It was an unusual one in the articles of companies, and he doubted whether there was any reason why they should import such an exceptional clause into theirs. It was giving a power to the directors to refuse their assent to any transfer of shares. If, however, there was any real cause why such a clause should be inserted, he had nothing further to say in the matter.

The CHAIRMAN thought that such a clause was to be found in every company's deed, or in most deeds, at any rate. The directors, after due consideration, had thought it best to propose a clause of this description. The company had been for 36 years in existence, and the clause in the old deed had never been acted upon, nor did he think that the one which they had now to propose ever would be.

Mr. FAWCETT observed that it was a power not generally used.

The SECRETARY said there was a powerful reason why such a clause should be adopted. It might be objectionable, under certain circumstances, to admit to the proprietary persons living abroad, whose interests were adverse to theirs. It might, indeed, prove a source of inconvenience if the company were open to every person abroad who desired to take their shares.

Mr. HUGGINS remarked that that was a valid reason certainly, theirs being a foreign company.

The CHAIRMAN said that foreigners might come and buy their shares, and cause extreme inconvenience to the company.

The resolution was adopted unanimously.

The CHAIRMAN next moved the omission altogether of clauses 22 and 23, relating to the registry of persons entitled to shares transmitted by the death, bankruptcy, or insolvency of any shareholder, or the purchase of such shares at a price to be agreed upon; as also the declaration to be made by the directors with regard to the same.

In lieu of clause 37, which stated that the shareholders should assemble at the house or office of the company, or such other place as the Board might determine, on certain days in the year, and also at such other times as an assembly or meeting of the directors should be convened,

The CHAIRMAN proposed the following:—"The shareholders of the company shall assemble at the house or offices of the company for the time being, or at such other place as the board of directors shall from time to time determine, on some day in the respective months of either June or July, in every year, at such hour and in such manner as the board of directors shall, in accordance with this and the other regulations of the company, appoint; and the shareholders shall meet at such other times and places, and in such other manner, as an assembly or meeting of them shall be convened, pursuant to the regulations of the said company applicable thereto."

Mr. FAWCETT seconded the motion.

Mr. HUGGINS suggested the adoption of the word "place," instead of "manner;" and a SHAREHOLDER observed there was nothing to prevent the directors meeting in Paris, if they should be disposed to do so. He thought their meetings should be confined to London.

The SECRETARY said the invention was that the shareholders should assemble at the offices of the company for the time being.

The resolution was adopted unanimously.

The CHAIRMAN next moved to repeal clause 48, relating to the elections and other questions raised at the meetings of shareholders, and the conditions under which a poll was to be demanded, and to substitute instead a clause as follows:—"At every general meeting all elections and all other questions whatsoever shall be primarily decided on a show of hands, by a majority in number of shareholders present; and this provision shall apply not only to resolutions which may be decided by a simple majority of votes, but also to resolutions which, in order to be binding on the company, must, according to its regulations or the Statutes affecting Joint-Stock Companies, Limited, be passed or carried by more than a simple majority; and unless a poll is demanded, at any such meeting, by a requisition in writing signed by at least five of the shareholders then present, a declaration by the chairman of such meeting that a resolution has been carried, and an entry made to that effect in the book or record of the proceedings of the company, shall be sufficient evidence of the fact, without proof of the number or proportion of the votes in favour of or against any such resolution."

The alteration was adopted *nem. con.*

The CHAIRMAN then moved the repeal of clause 51:—"At any general meeting every shareholder holding 10 shares and less than 30 shares, shall be entitled to one vote, and holding 30 shares and less than 60 shares, shall be entitled to two votes, and holding 60 shares and less than 100 shares, shall be entitled to three votes, and holding 100 shares or more, shall be entitled to four votes;" and to substitute the following in lieu thereof:—"At every general meeting, whether annual, extraordinary, or otherwise, on every question to be decided by poll, every shareholder present at such meeting, in person or by proxy, and entitled to vote, shall have a vote in respect of each and every share held by him or her in the company."

Mr. HUGGINS was sorry to move an amendment to this clause, as follows:—"That a shareholder should be entitled to vote for every share he might hold up to 100 shares, but beyond that number he should be entitled to one vote only for every 10 shares." This was a usual thing in other companies, and was necessary for the protection of the smaller shareholders. It was an easy matter for large shareholders to combine together, and to regulate the affairs of a company to its prejudice. It was wise, therefore, that there should be some provision to check such a power as that. It had been found to work well in other companies; for there could be no reason why a man holding 1000 shares should be able to come down to a meeting and overrule everything, and especially when they recollected that their meetings were attended only by a small section of the shareholders. He was satisfied the amendment he had to propose would meet the justice of the case, for, whilst the large shareholders would be well represented, protection would be thrown over the smaller ones at the same time.

The amendment having been seconded,

The CHAIRMAN said that the board had taken a great deal of trouble with respect to this clause, and had come to the conclusion that it was the best they could propose. They were desirous that every share should be represented, that

there should be a vote per share, which was the proper way of carrying on the business of the company. Of 35,406 shares, only 17,590 were represented under the old clause, whilst 16,345 possessed no value at all for any purposes of the company. Such a state of things was extremely unfair, and the remedy they proposed to adopt was one which was in practice in other companies, so that it was assumed that satisfaction would be given to all parties concerned.

Mr. HUGGINS said it was certainly his idea that all the shares should be represented.

The CHAIRMAN said that in all modern companies with which he had to do, they accepted such a regulation as the one proposed.

Mr. HUGGINS said that he felt very strongly the desirability of their adopting his amendment. He did not wish to disturb the harmony of the meeting, still he was anxious to take the sense of the shareholders upon it. He knew very well what influence a large holding gave a man over his colleagues.

The CHAIRMAN said that if a vote was given for every share it would be an additional stimulus to those who held a large number of shares to look after the interests of the company.

Mr. HUGGINS: Yes, but there is such a thing as having an excess of votes.

Mr. FAWCETT thought that the question had not been fairly discussed. A gentleman had objected to a preponderance of votes on the part of the large shareholders, but for his part he could not see any better form of representation than that each individual should have a vote for each share he might hold. With regard to the small shareholders, the meeting was perhaps not aware what a vast difference there was made in their favour by the alteration proposed. Whereas a man had then only one vote for 10 shares, he would by the proposed clause get ten; for 30 shares, two votes were given, but they proposed to give 30, or an increase of 28; for 60 shares, 60 votes instead of three; and those who held 100 shares would obtain an increase of no less than 96 votes. It would thus be seen that the small shareholders would be materially benefited. Next he would come to a class who had no votes at all, but under the proposed clause those who held merely nine shares would have nine votes. That, he considered, would be a great boon to the very smallest shareholders in their concern, and he thought such an advantage ought not to be forgotten. For his own part he could not see any advantage that would arise from the large shareholders placing themselves in antagonism with the small ones. That which was to the advantage of the large shareholder must be to the advantage of the small one; and it certainly would be so unless there was something radically wrong in the management of their company. He had heard no argument to controvert the well-considered decision of the directors. They had no other object than to give to each shareholder his fair and proportionate representation in the management of the company, and so that both large and small shareholders might be benefited alike. Unless there was some reason adduced why the clause proposed should not be adopted, he thought that the amendment ought not to be any longer considered.

Mr. BULLOCK said it was not what influence the large shareholders might have at present, but what they would be at liberty to exercise in the future. He presumed that the holders of 100 shares and upwards would be able to carry everything before them, and so render the votes of the other shareholders nullities, and nothing more. He considered the amendment a proper one, and would therefore support its adoption.

Mr. FAWCETT said that if the large proprietors did anything to swamp the company they must be doing a great injury to themselves. He thought it ought to be considered that if they determined to do an injury to the smaller proprietors they did an injury, in a large proportion, to themselves.

Mr. BULLOCK did not think that was the question.

Mr. W. SMITH said that he held the same views as the gentlemen who had spoken. That the largest shareholders might act in antagonism to the smaller ones he did not think was a question for the meeting then to discuss. They had met to transact matters of business. Hitherto there had been a certain number of votes allotted to persons holding a certain number of shares, and now they were about to increase it. Although it was said they were going to give the smaller shareholders greater advantages, by allowing them to have more votes, they certainly would not be benefited in proportion to the larger shareholders. It might be very well in theory to give the larger shareholder a vote for every share, but they knew there were a great many theories which would not work well in practice. Still it would not be to the interest of the larger shareholders to swamp the smaller ones, and he did not think they would do it, knowing full well the very creditable manner in which so many of them had managed the affairs of the company hitherto.

The CHAIRMAN said the worthy proprietor who had last spoken considered that the clause proposed would be a little to the disadvantage of the small shareholders in practice if not in principle. Now, he happened to belong to other public companies where it was in practice, and he never heard of any difficulties arising from it. So far as he knew, the system worked uncommonly well; for every shareholder felt satisfied, because he got his fair and proportionate representation. As a rule, in almost every company the small shareholders were the most active, whilst those who held largely were not the men to go and upset the value of the property, or do anything that would deteriorate it. There was another thing with regard to this company which required revision. A man could not vote at all unless he had been six months a shareholder. They intended to repeal that.

Mr. HUGGINS was very sorry he could not withdraw his amendment. He belonged to several companies, and had been a shareholder of the European for years, and, from the number of shares which he held, the adoption of such a clause could not possibly make any difference to him, but he had seen the working of a similar one in other companies, and considered it a very wise provision certainly. He must say that he never knew an instance in which the voting power was a vote per share. He had looked over some deeds that morning, and amongst other clauses he found the one he had proposed, which he believed to be a most equitable one to all parties concerned. He must beg to take the sense of the meeting upon the amendment, which he would move as follows:—"That every shareholder be entitled to one vote for every share up to 100, with an additional vote for every ten shares exceeding that number."

A show of hands was then taken, when there appeared—for the amendment, 7; against it, 32.

The original motion for the adoption of the clause was then carried.

The CHAIRMAN next moved to repeal clause 54—viz.: "No shareholder shall be entitled to vote at any general meeting, unless all calls due from him have been paid, and no shareholder shall be entitled to vote in respect of any share that he has acquired by transfer, unless he has been possessed of the share, in respect of which he claims to vote, for at least six calendar months previously to the time of holding the meeting at which he proposes to vote;" and to substitute the following:—"No shareholder shall be entitled to vote at any general meeting, whether annual, extraordinary, or otherwise, unless all calls due from him, in respect of his shares in the company, shall have been previously paid."

Mr. FAWCETT seconded the motion, which was carried unanimously.

Clause 57, stipulating the form in which the proxies should be given, was then repealed, and a new clause substituted in its place.

Clause 89, in lieu of the original one, was agreed to as follows:—"All moneys which shall be paid into the banking-house of the bankers for the time being of the company, shall be carried to the credit of the account of the company with the said bankers, and shall be withdrawn, or be liable to be withdrawn, from time to time, on or by cheque or cheques, signed by any two of the directors for the time being of the company, and countersigned by the secretary for the time being, or other officer authorized by the board of directors of the said company."

The CHAIRMAN next moved to repeal clause 104, standing as follows:—"It shall be lawful for the board of directors to employ any sum or sums set apart for depreciation and redemption of capital, in redeeming the capital of the company or any part thereof, and such redemption may be effected by the purchase of shares in manner before mentioned, such shares not to be reissuable without the sanction of a majority of a general meeting of shareholders; or by the repayment of a portion of the capital paid up *pro ratâ* to each shareholder, according to the number of shares held by him; or it may be effected in the following manner—that is to say: At any annual or other general meeting of the company, the board of directors may declare the sum then at the disposal of the company for the purpose of redeeming capital, and it shall be competent for such meeting, after such declaration of the board of directors, to appropriate such sum, or any part thereof, in paying off a proportionate number of the shares of the company at par, and to determine, by drawing lots or otherwise, the denoting numbers of the shares which shall be so redeemed or paid off. The chairman of the meeting shall then declare the numbers of the shares so to be redeemed, and the board of directors shall, after such meeting, give notice to the holders of such shares that they will be paid off at par within one month, and the holders of such shares shall, within such period of one month, be paid off accordingly, or have the money for their said respective shares tendered to them; and on such payment or tender, shall lose all rights, titles, and privileges in respect of such shares, which shall, from and after the date of the said meeting, thenceforth and for ever cease to participate in the dividends, interest, and profits of the company in respect of such shares, and the holders of such shares declared to be paid off shall surrender the certificate thereof. And it shall be lawful for the board of directors to cancel every redeemed or paid-off share, which shall accordingly cease to form part of the capital of the company." The clause which the directors wished to substitute was as follows:—"It shall be lawful for the board of directors to employ any sum or sums of money or stock, set apart for depreciation or redemption of capital, in redeeming the capital of the company, or any part thereof, and such redemption may be effected by the purchase of shares, in manner mentioned in the regulations of the company; such shares not to be reissuable without the sanction of a majority of an annual or extraordinary general meeting of shareholders of the company; or such money or stock as aforesaid may be employed and applied in the repayment of a portion of the capital *pro ratâ* to each shareholder, according to the number of shares held by him or her respectively, and the amount called up thereon." The necessity for the change had arisen entirely from the desire to get rid of the clause as to drawing shares when they had got an accumulation of capital. It was desirable that the directors should have the power of distributing their money *pro ratâ* in repayment of capital when they had any to spare.

Mr. FAWCETT seconded the motion, which was carried unanimously.

The CHAIRMAN then announced that the whole of the business for which they had been called together had been completed, and he was much obliged to those present for their attendance. The directors were exceedingly pleased to meet them on the occasion, and at all times were ready to afford them all the information in their power.

The SECRETARY stated that another meeting would be required to sanction the resolutions adopted that day. It would be held just previously to the annual meeting in July, when they hoped to see a large attendance of shareholders.

Mr. LEWIS proposed a vote of thanks to the chairman and directors for the very admirable manner in which they conducted the affairs of the company. They were at all times most assiduous in the performance of their duties.

Mr. STOKES seconded the motion, observing that the shareholders were exceedingly thankful at being able to secure the services of gentlemen who were so mindful of their interests at all times.

The resolution was carried unanimously.

The CHAIRMAN said that he and his brother directors thanked the meeting very much for this renewed mark of their confidence. Mr. Lewis had said they did all they possibly could to promote the interests of the company, and the results he thought pretty well showed the truth of the statement. He hoped to meet all those who were then present at their annual meeting, when doubtless the directors would have as good a report to present to them as ever.

Mr. CROWDEN said that the meeting could not possibly separate without returning a vote of thanks to their indefatigable secretary for the attention he continued to pay to the interests of all parties. Mr. Backler was deserving of all praise.

The CHAIRMAN said that he would cordially second the motion. Their thanks were eminently due to their secretary for the good services he had rendered on all occasions.

The motion having been unanimously adopted,

Mr. BACKLER thanked the meeting for their kindness, and said that he would always endeavour to do his best under the new regulations, as he felt he had done under the old.

The meeting then separated.

BRITISH ASSOCIATION OF GAS MANAGERS.

The Seventh Annual General Meeting of this Association was held during the past week at the Rooms of the Society of Arts, John Street, Adelphi, London. MAGNUS OHREN, Esq., A.I.C.E., Vice-President, occupied the chair.

TUESDAY, JUNE 7.

The first sitting was held this morning, when the chair was taken at eleven o'clock.

The HONORARY SECRETARY (Mr. W. H. Bennett) read the minutes of the sixth annual meeting, held last year at Liverpool, which were approved.

The annual financial statement of the association having been previously printed and circulated among the members, was taken as read, and was received and adopted.

The HONORARY SECRETARY read the following list of applications for membership which had been submitted to the committee.

Barrett, W.	Accrington.
Beale, F.	Hackney.
Blanchett, E. R. . . .	Calcutta.
Bower, F.	Low Moor, Bradford.
Child, F.	Sheffield.
Clark, H.	Imperial Gas Company, Shoreditch.
Clark, J.	Imperial Gas Company, St. Pancras.
Clift, J. E.	Redditch.
Cornish, J. H. . . .	Bridgwater.
Cross, S.	Abergavenny.
Doughty, F.	Margate.
Drew, T. A.	Crewe.
Duff, W.	Morecambe.
Eldridge, H. O. . . .	Richmond.
Evans, E.	Peterborough.
Evans, F. J.	Chartered Gas Company, Westminster.
Farrand, C.	Croydon.
Fish, R.	Hornsey.
Foulis, W.	Glasgow.
Gill, R.	Bridgnorth.
Goodwin, J.	Rotherham.
Harris, R.	Great Central Gas Company, Bow.
Hastings, P. W. . . .	Pinner.
Helps, G.	Bath.
Humphreys, W. C. . .	New Barnet.
Hunt, Charles . . .	Nine Elms.

Jones, H. M. L. . . .	Westminster.
Jowett, J.	Leeds.
Kitto, C. W.	Tunbridge.
Kitt, A.	Chartered Gas Company, Curtain Road.
Lawson, J. W. . . .	South Shields.
Littlehales, Thomas . .	Wormwood Scrubbs.
Methven, John . . .	Gravesend.
Middleton, J. . . .	Wandsworth.
Moir, John	Shotley Bridge.
Murray, J.	Scotswood.
Niven, R. J.	Kettering.
North, W.	Stourbridge.
Osborn, J. H. . . .	Bromley.
Padfield, W. A. . . .	High Wycombe.
Paterson, R. O. . . .	Cheltenham.
Pontifex, S.	New Barnet.
Pritchard, W. . . .	St. Helen's.
Rowan, J.	Colchester.
Scott, G.	Tunbridge Wells.
Severs, —	Birstall.
Smith, H. W.	Seaham Harbour.
Smith, T.	Wigan.
Studholm, S.	Whitehaven.
Trewby, G. C. . . .	Chartered Gas Company, Westminster.
Vanheson, G. B. . . .	Rochester.
Wilson, W. P. . . .	Strand.
Wright, C.	Saffron Walden.

It was unanimously resolved that the gentlemen whose names had just been read be elected ordinary members of the association.

The HONORARY SECRETARY read the names of several gentlemen who had expressed a desire to become extraordinary members of the association, under the provisions of rule 4.

The PRESIDENT said the committee were quite of opinion that the list of extraordinary members was being somewhat unduly increased, and that it was a question which the association would do well to consider. The rule 4 provided that extraordinary members should consist of gentlemen taking an interest in matters connected with gas manufacture, who should only be admitted on being elected by a majority of two-thirds of the members present at an annual meeting, and they were required to pay an admission fee of £5 in addition to the ordinary subscription. With reference to the gentlemen whose names had been read by the secretary, it was perhaps rather too late to raise the question on the present occasion, but it was important that the association should act with caution in the future.

Mr. G. LIVESEY said he hardly liked to raise the question at that time whether it was advisable to continue to admit extraordinary members according to rule 4, under which "gentlemen taking an interest in matters connected with gas-works" were eligible, and in the remarks he should offer on the subject he should speak as an individual member, and not at all as representing the committee. Nearly every member of the committee, including himself, had either proposed or seconded one or more of the gentlemen whose names had been read, as, under the rules, they were bound to do. From conversation he had had with several of the members, he thought it was desirable that an opportunity should now be given for the expression of opinion on the subject, now that the question of electing extraordinary members was before the meeting, so that the committee might know how to act, and what recommendations to make for future guidance. The rule of the association was a very vague one. Under it they began by electing manufacturers, now they were coming to manufacturers agents, and it would require great prudence on their part, or they would drift into that which would damage the association.

The HONORARY SECRETARY, in reply to an inquiry as to the proportion of extraordinary members to ordinary members, said the number of extraordinary members was 9, and of ordinary members 250.

Mr. WARNER (South Shields) said as he was the first to raise an objection to the admission of extraordinary members, he felt bound now to say that, in his opinion, having created that class of membership, they ought to continue it. There were many manufacturers who took as deep an interest in the progress of gas lighting as any gas manager could do, and had a far greater personal interest in the subject than some of them had. As the members of the association had the matter always in their own hands, and could reject by their votes any candidate whose fellowship they might not desire, no harm could come by retaining the present rule.

Mr. BROADHEAD (Great Grimsby) said he objected at the second meeting to the creation of extraordinary members, as he was apprehensive the association would be made use of for trade purposes. In those early days, however, there were reasons for the course then adopted, but now the association could afford to give it up.

Mr. A. WILLIAMS thought the prejudice to extraordinary members arose from the name. It was singular that those who might fairly be supposed to know least about the subjects discussed at these meetings should be called "extraordinary," and those who were the most thoroughly and practically acquainted with them should be merely "ordinary." He was in favour of continuing the existing rule.

Mr. G. ANDERSON could see no difficulty in connexion with the subject. The rule provided that gentlemen interested in gas matters were eligible as extraordinary members. This did not mean "interested" in a pecuniary sense, but interested intellectually, and likely, by the part they would take in the discussions of the association, to instruct and interest the other members. It was clearly unadvisable to allow persons who had a mere money interest in these matters to join the association, otherwise there would be the danger of it becoming a canvassing society for trade purposes, and the liberty of gas managers would become fettered thereby. To give the committee the opportunity of reconsidering the question, he would move that the election of extraordinary members be postponed until the following day.

Mr. D. CLARK seconded the motion.

Mr. BARTHOLOMEW (Glasgow) pointed out what he feared would be a hardship in some cases. He, for one, and Mr. Sharp, of Southampton, were not now connected with the manufacture of gas, and if the rule which admitted to extraordinary membership were expunged they would be cut off from connexion with the association.

The PRESIDENT said that Mr. Bartholomew, having already become a member, would continue so as long as he pleased. He did not see any objection to the postponement of the question, that the committee might take it again into consideration.

The motion was put and carried.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—You are aware that our friend Mr. Esson was at our last meeting elected president of this association, and Mr. George Anderson and myself vice-presidents. You have been informed of the severe illness which has deprived you this day of the services of a gentleman whom you did the honour to elect to a position that, had he been present, would have justified the high opinion you had of him. I am sure that you feel with me deep regret at the cause of his absence, and that, although absent, our sympathies are with him and his family, and our earnest wish is that he may be soon restored to health. When our secretary heard that Mr. Esson's medical advisers had prohibited him from taking any part in the proceedings at this meeting, a special committee was convened to take the subject into consideration, as it became necessary that one of the vice-presidents should at once be elected to carry out the important duties of president, that the association should not suffer by the loss of your president's services, to this office I was proposed by my brother vice-president, Mr. George Anderson, and as the committee were unanimous in their approval of that proposition, and as the vice-presidents were elected to perform that very office, should occasion require it, I felt bound to accept the trust and carry out the duties to the best of my ability. It is under these circumstances that I preside over you this session and it is therefore my province to deliver an address to the members of this association upon gas matters in general, but particularly to draw attention to any new subject which may have an interest to gas managers, or conduce to the interests of the companies with which we all are connected.

I make the attempt with great pleasure, but, at the same time, with great diffidence, surrounded as I am by so many members of the gas fraternity, whose attainments and general knowledge of gas engineering far better qualify them for the duties which it has fallen to my lot to perform; yet, however unworthily those duties may be discharged, when compared with those of the gentlemen eminent in their profession who have addressed you before—I mean the past presidents of this association—let me assure you that any failure on my part will not be from want of perseverance or attention to the duties I have undertaken.

I think the first thing I should direct your attention to is, the stability and prosperity of this association, for I conceive that if I can present to you a prosperous state of affairs it will relieve your minds of all doubt as to the solid foundation on which the association stands, and on that point, I may congratulate you, we are working with good will and harmony, not only in committee, but amongst the members generally, and the number of members is, consequently, steadily increasing.

Before our June meeting of last year, we had on our books 214 members of all classes (honorary, extraordinary, and ordinary members); at that meeting we added 52 members to our number, making it 266, and you have just elected 52 new members, bringing our number up to 318. There are, I know, many members who are most anxious on this subject—the financial position and prosperity of the association—their great desire being to create a gas managers benefit-fund. Well, the committee go with them in that very laudable desire, but with all their desire to establish such a fund, they consider that the time has not quite arrived; nevertheless, there is a notice of motion on the subject by Mr. Warner, and all I can say is, that if the members think that the present strength of the association will warrant the starting of such a fund, every member of the committee will exert himself to establish it on the best possible foundation.

The subscriptions for 1867 amounted to £140, and left a balance in the hands of the treasurer of £6 odd; last year the subscriptions amounted to £210, with a balance in hand of £63; and this year, to the 30th of April, we have a balance in hand, after meeting our liabilities, of £135; so that we have now in this association the germ of prosperity.

Now how has this prosperity been arrived at, and how is it to be maintained? Why, by the amount of benefit members receive and impart by the interchange of opinions and ideas, and by the large amount of useful information to be gleaned at our meetings. Such being the case, you will be pleased to learn that we have no fewer than twelve papers promised for this session for reading and discussion on important subjects. The first paper on my list is on the "Setting and Working of Retorts," by Mr. Cathels, and whatever light may be thrown on this subject, to my mind, the "setting and working of retorts" is one of the greatest importance, and I make no doubt much good will result from Mr. Cathels's paper, and the discussion which such an important subject is sure to elicit; for, remember, low-priced gas, dividends, and last, though not least, fees and salaries, are produced from the retort, a residual product so to speak of good carbonizing.

The next thing of importance, after making the gas in good productive *quantity*, is *quality*. Gas can be made practically free from impurities, and it is but right that the consuming public should have pure gas to burn, especially now that chemical science has shown us the way to free our gas from those impurities which 30 years ago we supplied with the gas, because we had not then the knowledge required to grapple with those difficulties. About that time, with gas at 10s. per 1000 cubic feet, I remember perfectly well, when testing the gas for sulphuretted hydrogen by means of acetate of lead—the only test for sulphur known to gas engineers of that day—I often found the test of a shade which, if found in the gas of the present day, would make Dr. Letheby's hair stand on end with horror at the amount of impurity. Mind, I am giving you my experience of 30 years ago, when I was a pupil of the engineer of one of the London gas companies. Chemical science has, however, made vast strides since then, and the case is very different in the present day. Gas can now be, and should be, sent out to the public free from visible sulphuretted hydrogen and ammonia; and, further, no well-regulated gas establishment should now send out gas of a less illuminating power than 12 standard sperm candles, burning 120 grains, when compared with 5 feet of gas burnt through the Letheby London burner, nor less than 13½ candles burnt through the gas referees' or Sugg's new "London" burner, and I believe the consumers have no cause to complain that this is not done. Gas managers are constantly trying new inventions to improve the purity and illuminating power of gas, and when thoroughly proved the members are always willing to impart the knowledge so gleaned, and there is scarcely a meeting of this association but we have a paper on purification in some of its branches, showing the proper importance that members attach to this subject. On the present occasion we have two such papers, one by Mr. Upward, of the Chartered Gas Company, on purification; and one by Mr. George Livesey, of the South Metropolitan Gas Company, on scrubbers. I trust we shall also be favoured by some remarks from Mr. F. C. Hills, of Deptford; Mr. J. B. Paddon, of Hove; and Mr. J. W. Pollard, of Mincing Lane (one of our new members), embracing their views on the subject of which those papers treat. I must, however, particularly draw your attention to scrubbers. Of all apparatus in general use upon a gas factory, probably no portion is so uncertain and unsatisfactory in its operation as the ordinary coke scrubber. Care is taken, in designing this purifier, to provide scrubbing surface of proper proportion to the gas made, but the maintenance of this proportion is a question of time, and often of very little time. Under very favourable conditions, as regards the kind of coal used and the condensing apparatus through which the gas has previously passed, the scrubber may perform the duty for which it was intended; but almost always when a scrubber is opened it is found that there is just sufficient room in the centre to pass the volume of gas for the time being, all other openings being filled with deposit. Some admirable arrangements for distributing liquor are in use, but no mode of distribution of water or liquor that I know of can prevent or dislodge this deposit. Steam has been successfully used to prolong the life of the material, and save the cost of changing it; but any force the water may possess is exhausted by the upper strata of scrubbing material, and it simply finds its way to the central apertures through which the gas ascends. My brother, Mr. John Ohren, the engineer-in-chief of the Rio de Janeiro Gas Company, substituted plates of iron for trays of coke, and with good effect; and Mr. George Livesey will explain in his paper an admirable arrangement by means of thin boards placed edgeways tier above tier, which he has used at his works, and which, he says, is very effective, never gets out of order, and never wants changing. Well, so far, we seem to be arriving at a point of perfection in scrubbers; but then we find we have arrived at the same time at a

knowledge that the scrubber is, after all, not the friend to gas managers it was supposed to be. We know that scrubbing is very effective in taking out the ammonia from the gas, and it having been found necessary to reduce the amount of sulphur compounds contained in the gas, to comply with the conditions required by the Metropolis Gas Act of 1860, that gas should not contain more than 20 grains of sulphur in every 100 cubic feet, the ingenuity of gas managers and gas chemists became taxed to devise means to this end. Amongst other experiments, the washing of the gas in the scrubbers, more particularly with ammoniacal liquor, was found to be beneficial in removing sulphur, and it was supposed that the greater the scrubbing surface the greater the amount of sulphur removed; but to the present time we have no reliable data to go upon. From careful testings of the gas for sulphur compounds, before and after entering the scrubber, to ascertain the full effect of the working of that part of the purifying apparatus, we find that the amount of sulphur in the gas varies from day to day in a remarkable manner, and from causes not yet ascertained.

The board of gas referees have to determine a maximum for the sulphur compounds, and therefore their proceedings are of extreme importance to the London gas companies. Averages are of little use here, for the London Gas Acts of 1868-9 require that the maximum shall, under heavy penalties, be observed for each single day. The referees have not yet issued any public report on the subject, but I learn that experiments on a manufacturing scale—the only ones reliable—have been made, and are still in progress, under the instructions of the referees, which unquestionably will throw much light on this difficult point. Among others, a systematic series of experiments is being made to ascertain the efficiency of each separate part of the various purifying processes employed in gas-works. My successor in office will be in a position to comment upon these experiments at the next annual meeting of the society. For myself, judging from the information given to me by the engineers conducting those experiments, I must say that the idea entertained in many quarters of trusting to increased scrubbing power as a means of lessening the amount of sulphur in the gas is wholly contradicted by the result of those experiments, so far as they have gone. I may add, that if the referees properly and wisely discharge the important duties devolving from time to time upon them, the result cannot fail to be of much use to the science of gas manufacture; for they have, what none of us have had before, the means of instituting careful experiments, upon a uniform plan, in each of the large gas-works under their supervision, and thereby combining and bringing to a focus the knowledge of the able engineers of the several companies, and sifting out the truth in a practical and reliable manner.

I cannot quit this subject without calling your attention to a new apparatus which the gas referees have devised for the testing of gas for sulphur compounds other than sulphuretted hydrogen. I have obtained from Mr. Sugg a specimen of this apparatus. The main difference between it and the Letheby apparatus is twofold—firstly, instead of a large empty cylinder, the referees use a small upright cylinder filled with glass balls, a sort of scrubber, in fact; secondly, a careful adjustment has been made in order to ensure a good draught. The bottom of the Letheby apparatus is left open, and also the area of the lower end of the "trumpet-tube" is considerably larger than that of the upper end; accordingly the instrument, besides requiring to be carefully guarded against side draughts, is liable to this drawback, that the external air, although drawn up by the heat to the height of the burner, cannot all pass upwards through the narrow orifice above, and consequently is liable to regurgitate and escape again at the lower end; in the referees instrument this is prevented by covering the lower end of the trumpet-tube, and narrowing the admission of air in such a way as to improve the draught, which at the same time protects the lower end of the instrument from the action of external currents. From experiments made with the two instruments, I find that the amount of sulphur obtained by the referees test is as 30 grains against 24 grains obtained by the Letheby apparatus. I need hardly say that the adoption of this more efficient test for the sulphur compounds must, in justice to the gas companies, be properly taken into account by the referees before they fix the maximum of sulphur to be allowed in the gas of the companies placed under their supervision by the recent Acts of Parliament.

The next paper sent to the committee is by Mr. Somerville, of Dublin, who will give his additional experience of the working of Best and Holden's iron stoker. I have seen the one at Dublin at work, and I would draw the attention of gas managers to the subject, more especially managers of foreign works. In places where labour is scarce, and consequently expensive, and particularly in hot climates, an iron stoker, simple in its working arrangements and management, would be of great advantage. From what I have seen of Best and Holden's iron stoker, I have no doubt that it is very costly, and a large number of retorts must be worked to make it remunerative to the company, and then, bear in mind, the retorts are built to suit it, and not it to suit the retorts, so that it would not do for general use; but let the iron stoker be found to be useful and remunerative, and it will be constructed to suit beds of retorts as at present built. We have only to direct the attention of engineers to the want of a machine, and if it is at all likely to pay them for their trouble and expense in designing and perfecting it, they will never tire until that want is supplied. Of this fact we have evidence in the iron stoker produced by Messrs. Dunbar and Nicholson for drawing and charging single retorts. The want was felt, and to a great extent has been supplied, and I make no doubt that that firm, as well as others, are now at work on plans all tending to that end—the production of a machine perfect in its working adapted to suit all sorts of setting.

Another example of a want being supplied is shown by the production of the "iron lamplighter." It was found that an "iron lamplighter" was wanted, as well as an "iron stoker," and the result has been the production of some ingeniously contrived apparatus, of various sorts, to effect the object required.

Mr. Price, whose apparatus was described at the last annual meeting, deserves credit for his step, which is in the right direction. His regulator (the controlling apparatus) is an ingenious adaptation of the "Cathels district main governor," and it appears to answer equally well on a small scale as on large district mains.

Since our last meeting we have two additional "iron lamplighters"—the hydraulic lamplighter and the pneumatic lamplighter, the first designed by Mr. Hunter, an engineer, but not connected with gas-works. He has produced an apparatus to be worked by hydraulic power. The peculiar feature is that by one operation the tap is opened, a match struck, and the gas lighted. A service-pipe is to be laid throughout the district to be lighted, with branches to each lamp. The pipes are charged with water, and the pressure required is given and maintained from a tank placed at the required elevation. Inside each lamp-post is to be placed a small cylinder, to the piston of which is attached a rod. The top of this rod is serrated, and gears into a toothed wheel attached to the plug of the lamp-tap, which is turned round, and opened as the rod rises. A small fusee drops from a reservoir, and is carried by a swivel plate to a piece of roughened spring, on which it is rubbed and ignited. It is then carried round past the burner, the gas is lighted, and the fusee drops to the bottom of the lantern. In the morning, when the gas is to be extinguished, the pressure of water is taken off the cylinders and an escape-tap opened, the pistons drop with the weight of the rod, and the taps are turned off. It is proposed that, as the lamps are cleaned weekly, the lamp-cleaner shall supply the reservoir with a week's supply of matches.

Now, up to this point all is satisfactory. I have tried the model apparatus repeatedly, and found it to work well, the only exception to the general plan, as worked by the model, being the ignition of the matches, as they occasionally fail; but this is a difficulty of little moment, as good matches can easily be procured. My great objection was, that in a hilly district the pressure of water could not be taken off the cylinders; therefore the pistons in the lamps on the side of a hill would be kept up by the pressure from the top of the hill, and as it would be out of the question to take the water out of the pipes every morning, and recharge them before night for relighting, the lamps would continue burning. Mr. Hunter, when I discussed the matter with him, thought to get over this difficulty by weighting the rods, and varying the size of the cylinder; but he took my advice not to commence in a hilly district, and he is prosecuting his operations at Southport. Another greater difficulty I foresee is the freezing of the water in the pipes in winter, which, I fear, will curtail his richly deserved reward for his beautiful invention. One hint I may throw out for his consideration—the use of sea water. It is not only at the sea-side that this can be got, but, as a company is forming to supply sea water in London at a cheap rate, the London gas companies can be supplied with sea water for their iron lamplighters, unless it be superseded by the pneumatic lamplighter, the second invention mentioned, the patentees of which, Messrs. Stephenson, Bartholomew, and King, have no doubt foreseen the difficulties I have spoken of. Their "iron lamplighter" is worked with air instead of water, and from all I at present see will prove a success. There is a model working apparatus on the table, and members will not only have a chance of seeing the working of it, but have an explanation, if time will permit.

Since writing the foregoing, I have heard from Mr. Hunter. He says: "I am happy to say the apparatus works well. All through the last winter it has been entirely uneffected in its working by frost; the lamps light in rapid succession, so that the cylinders are not all required to be filled at the same moment, consequently a small water-pipe will answer the purpose."

We speak of "iron stokers" and "iron lamplighters" that may serve us by-and-by, but in the meantime let us all remember that the stoker of the present day is flesh and blood—one of ourselves; let us not forget that while we enjoy the blessing of rest from our labours on the seventh day, the stoker of the period must be at his post on that as well as on other days. It gives me great pleasure to find that the subject has been taken up by Mr. Morton, of the London Gas Company, and that he will read a paper on Sunday labour. This subject was introduced, I believe, by Mr. Livesey, of the South Metropolitan Gas Company. He commenced by giving his men a Sunday holiday once a month. It was also introduced at my company's works some years ago, and has been continued ever since; in fact, we have lately given the men one Sunday out of every three instead of every four, to carry out the desire of the directors of my company to reduce Sunday labour as much as possible. I do not know how Mr. Livesey progresses with the Sunday question, but I trust we shall have his own views thereon during the discussion on the subject. I think that directors of companies will only want it made clear to them by their managers, that the men can be to a great extent dispensed with on that day, to restrict Sunday labour to its lowest possible limit. The men work hard, and it is a duty of humanity, even if we take no higher ground, for persevering in carrying out this most desirable object. It is very possible that Mr. Morton will speak of the labour of the stoker. There can be no doubt about the work being hard, and in the summer time very oppressive. I once made an experiment to ascertain what amount of heat the men were exposed to. The thermometer at my office stood at 65° at seven o'clock in the evening, in the month of September, when the men commenced taking off the retort-lids.

At	7.15	the thermometer rose to	70°.
"	7 25	" "	80°.
"	7.30	" "	88°.
"	7.35	" "	90°.
"	7.40	" "	99°.
"	7.50	" "	105°.

And this was the highest point.

At	7.55	it fell to	99°.
"	8	"	97°.
"	8.5	"	90°.

The men had then finished their draw, and left the retort-house; at 8.15 the thermometer fell to 70°, and I left. The retort-house is large and well ventilated. The men were in fine healthy condition, and some of them had been a long time in the employ of the company, and none of them had suffered illness from heat; nor do I remember regular stokers being incapacitated from excessive heat, except in a few cases of men green from the country on their first employment, more especially in hot weather. Circumstances, of course, alter cases; my remarks apply to the Crystal Palace District Gas-Works. After Mr. Morton's paper is read we may get the experience of others. But I think it will be readily admitted that the stokers, as a body, are hard-working men.

The next paper is by Mr. T. H. Methven, of Bury St. Edmunds, on "Tar Pavements." We all long for the luxury of tar pavements along our country roads, and I make no doubt the system would be largely adopted if the material could be made hard and durable, so as to save us, in summer weather, from sticking to the pavement, like flies in treacle. I hope that Mr. Methven's system is satisfactory on this point; for myself, I consider it necessary to boil the tar, to drive off the light oils and water, otherwise the material will not set firmly, or at least until the sun has done the work that should have been done previously. If, then, it becomes necessary to remove the light oils, I consider they should be removed by distillation and utilized, instead of being boiled off in the open air, to the great nuisance of the neighbourhood where the operation is performed; for remember, in those oils, which would be lost in open air boiling, we have benzole, &c., from which aniline is made—the base of those beautiful colours, magenta and mauve—so fully reported upon at the last annual meeting by the president for that session, Mr. Goddard.

Mr. W. T. Fewtrell gives us a paper connected with tar—on "Artificial Alizarine;" or, chemically speaking, on alizarine artificially produced from a base obtained from coal tar oils, called anthracene; this is, however, not made from the *light* oils before alluded to, but is obtained from the last of the *heavy* oils, commonly called creosote, which comes over just previous to the tar becoming *hard* pitch.

While on the subject of tar, I may state that another important use that tar is likely to be put to is in the manufacture of gas. As tar contains a large quantity of rich hydrocarbons, it has engaged a large share of the attention of gas managers, who for many years have, by various means, endeavoured to convert the valuable fluids which it contains into permanent gases. Their attempts, however, have not been attended with anything like success—principally because it was found that solid deposits and naphthaline caused obstructions in the mains and pipes, and carbon on the retorts, without the anticipated increased quantity of gas. An improvement has, however, been introduced at Cork, by Messrs. Still and Lane, and although the new process has been in operation there over a year, no deposits have been observed in either the manufacturing or distributing apparatus.

The essential difference in their process, which, by-the-by, they have patented, consists in the thorough amalgamation, by suitable machinery, of the tar with a portion of the coal which is to be carbonized. From 30 to 40 gallons of tar are mixed and ground up with three-quarters of a ton of coal and a quarter of a ton of breeze; the proportion to be used is 25 per cent. of the total quantity of coal to be carbonized.

The advantages claimed for the process are a large yield of gas, increased illuminating power, and reconversion of breeze into coke, its particles being cemented together by the pitch of the tar. It is said that inferior Welsh coal treated under this patent can be made to yield 15-candle gas, tested by the old London burner. The theory of the process appears to be this—that while in former experiments the tar was merely distilled, in this process it is in a great measure decomposed, and the poorer gases coming from the coal while in their

nascent state combine with the rich hydrocarbons of the tar, which are thus converted into permanent gases, instead of condensing and forming obstructions in the apparatus. The patentees have given a long trial to the process before endeavouring to get it adopted by other companies. Some trials have been made in Dublin, extending over several weeks, which have resulted, it is reported, in considerable economy of manufacture. If further experience confirms these results, gas companies—particularly where the iron stoker is in use—will no doubt adopt the process, and as a consequence, tar will rise in price, as a great quantity will be withdrawn from sale. Gas managers will do well to bear this in mind in making their contracts for the sale of tar.

We have next a paper by Mr. D. Clarke, of the gas-works at Brymbo, on "Stoppage in Ascension-Pipes"—a capital subject to ventilate—and your attention should be closely given to this paper, and the views arising therefrom freely discussed. It is useless to have good retorts and good settings, if the gas does not pass freely from the retort when genorated; the loss that occurs in many places while the so-called "jumping" process is being performed is most distressing to witness.

I hope Mr. Clarke will throw new light upon this subject. If he advocates large ascension-pipes and capacious hydraulic main, not too close in contact with the retort-beds, he will be in the right track; but I will not anticipate his views, I desire only to give a direction to the discussion on the subject after the paper is read.

And the subject analogous to this, "The Scurfing of Retorts," is, I believe, to be brought forward by Mr. Cockey, who has an apparatus for scurfing retorts. Like the stoppage in ascension-pipes, the deposit of carbon on the retort results from pressure, or the want of relieving the retort from the gas as generated, and the aim of gas managers should be, not to devise apparatus to remove carbon, but to prevent the formation of it. It is a known fact that although a gas-exhauster, working at level gauge, draws off a considerable portion of the gas produced in a retort, still a pressure is maintained in the retort equal to the seal of the dip-pipe, and that, if that pressure is not removed, a large portion of gas is destroyed in the retort; this is particularly the case where through-retorts are used, if the dip, and consequently the pressure, on one side is greater than on the other. About ten years ago I had experience of this fact. The sinking on one side of some through-retorts caused an increase in the seal of the dip-pipes on that side, consequently the whole of the gas generated passed off at the other side, the pressure there being lightest. To remedy this defect, I invented an apparatus, which I called a "moveable disc," by which the liquor in the hydraulic main could be regulated, and the pressure equalized, allowing the gas to pass off at each end; when this was done the carbon ceased to accumulate on the retorts, and the make of gas and illuminating power were increased. If any gas manager finds himself in the same difficulty that I did, and would like to try the effect of the apparatus, I refer him to Mr. Sugg, of Westminster, who made the apparatus for me, and has, no doubt, the patterns by him.

We have a paper by Mr. Goddard, of Ipswich, on the "Application of Gas to the Generation of Steam." Any application of gas to the uses of man must be a benefit to the gas producer as well as to the gas consumer, and therefore the application of gas to the generation of steam, whether for machine power or for cooking, if effective, must cause an increase in the sale of gas. That gas can be used for cooking with advantage is a fact known to many of us. Mr. Somerville, of Dublin, introduced cooking-stoves at Maidstone, and so satisfied were the consumers with the use of his stoves, that they were taken faster than he could make them, and his summer consumption of gas was largely increased thereby. I believe he has also introduced them at Dublin, and I have no donbt with good results. Hitherto the great drawback to cooking-stoves has been the smell, but by using stoves made with glazed tiles and atmospheric burners, there is no smell, and they can be fixed in any part of the house, as they require no chimney. The benefit to be derived from the use of these stoves in small houses during the summer months is self-evident. From experiments made by myself, I have found that the cost of gas for cooking a joint is very much less than coal, if the fire has to be made for that purpose only. These stoves have just been introduced to our consumers; they cost the company £5 5s. each, and we let them out at a rental of 2s. 6d. per quarter. I recommend gas managers to consider this subject, with a view to increase their summer consumption.

GAS COOKING-STOVE EXPERIMENTS.

GAS.

Date. 1869.	Joint.	Weight.	Time.	When Cooked.	Dripping.	Loss.	Gas Used.	Cost of Gas at 4s. 5d.
		lb. oz.	h. m.	lb. oz.	lb. oz.	lb. oz.	ft.	d.
Sept. 22	Leg of mutton....	8 1½	2 20	7 5	.. 5	.. 7¼	41	2·17
,, 25	Rib of beef.....	10 14	2 37	9 10¾	.. 5¼	.. 14	46	2·43
,, 30	Leg of mutton....	9 7	2 30	8 6	.. 7½	.. 9¼	42	2·22
Oct. 6	Rib of beef.....	11 ..	2 45	9 13	.. 4½	.. 14½	48	2·54
		39 6½	.. ..	35 2¾	1 6¼	2 13¼	177	9·36

COAL.

Date. 1869.	Joint.	Weight.	Time.	When Cooked.	Dripping.	Loss.	Coal Used.	Cost at 22s. per Ton.	Wood	Total Cost.
		lb. oz.	h. m.	lb. oz.	lb. oz.	lb. oz.	lbs.	d.		d.
Sept. 22	Leg of mutton	8 1½	2 50	7 ⅜	.. 8	.. 7⅜	28½	3·36	0·50	3·86
,, 25	Rib of beef ...	10 14	2 45	9 10¾	.. 5	.. 14¼	29	3·42	0·50	3·92
,, 30	Leg of mutton	9 12	2 30	8 ..	.. 10	1 2	28	3·30	0·50	3·80
Oct. 6	Rib of beef ...	13 2	2 50	11 13	.. 6	.. 15	30	3·53	0·50	4·03
		41 13½	.. ..	36 8¼	1 13	3 7	115½	13·61	2·00	15·61

The following experiment was made by the maker of these stoves, and verified by subsequent trials:—

A leg of mutton . . .	8½ lbs.	Three tarts	2¼ lbs.
Gooseberry pie . . .	3 lbs.	Potatoes	3 lbs.
Baked rice pudding . .	4¼ lbs.		

The rice, being baked unboiled, took longer to cook than the other things; the potatoes were cooked over one of the top burners, and the gas consumed for the whole was only 56¼ feet, costing about 3d.

There are three top burners, so that soup and fish could have been cooked at the same time.

Mr. W. J. Warner, of South Shields, will give us a paper on "Gas-Meters." My own opinion respecting meters is, that in the "Sanders and Donovan's" patent wet meter, as now manufactured by the Gas-Meter Company, we have a perfect wet meter, and I look for improvements in the dry meter. The best description of dry meter I have used is that commonly called "Croll and Glover's meter," but there are still improvements to be made in it to ensure accuracy of registration after having been at work for three or four years, and although those in error bear only a small per centage to the meters made, we look for improvements to reduce even that small per centage of error, which is very annoying to the company and the consumer when it does occur.

The measure of the illuminating power of the gas follows next. Mr. Hartley will read a paper on "Photometry." Mr. Warner's is an important subject, the measurement of gas fairly and justly between the company and the consumer, and of almost equal importance is the measurement or determination of its quality, for unless the system in either case be of such a nature as to ensure accuracy of result, the relations between the seller and the buyer of gas can never stand on a satisfactory footing; hence any new system by which our measures may be improved, or any modification of the present system which appears to be an improvement or is put forward as such, claims the attention of gas managers.

Among the novelties of photometry is the apparatus designed by Mr. F. W. Hartley, of Westminster. The apparatus consists of three photometers converging to a common centre, which is occupied by one candle, so that three operators may determine the illuminating power of any one of three gases compared with one and the same candle. Fortunately the days are passing away when two or more gas companies were allowed to supply gas in the same street, generally resulting in a waste of the shareholders money, and a loss to the consumer, otherwise this photometer would have been useful to try one company's gas against another, but now I do not see the object to be obtained. I can understand three operators testing the gas at one time, and then comparing their results. I believe they would be nearer the truth than three separate testings by a single burner; not that I put much faith in the report of difference in human vision. I believe the difference to be in the candle, not in the vision; and I am led to infer, if this be so, that Mr. Hartley's instrument would be more perfect if his gas were in the centre, and the candles placed at the three points. The difficulty that I have experienced most in photometry is the variation in the amount of light given by different sperm candles, and even different parts of the same candle, and under different temperatures; and I conceive that the more we multiply the candles the nearer we arrive at a correct average. Supposing, then, we have three pairs of candles, two at each point, by this means any variation in one pair of candles will be checked by the other two pairs; for, although not impossible, yet I think it hardly likely that all the candles would err exactly in the same way; at any rate a certain number of experiments must necessarily end in a more perfect result than at present obtained with the single apparatus, and this fact I believe was maintained by Mr. Kirkham in a paper read by him at the Institution of Civil Engineers last year. A lecture is to be delivered by him and Mr. Wm. Sugg this evening, on "Photometry as Applied to the Estimation of the Value of Coal Gases," and as a matter of course the "cross photometer" will be exhibited and explained; so that, with Mr. Hartley's paper and Messrs. Kirkham and Sugg's lectures, members will have a history of photometry to the present day, and will be able to judge the merits of each apparatus.

I find, connected with this subject, that we are to have a paper by Mr. Charles Heisch, the gas examiner to the Corporation of London, "On the Method of Testing the Illuminating Power of Gas, with special reference to Burners."

I take this opportunity to direct your attention to a report made to the Board of Trade by the referees appointed under the City of London Gas Act, 1868. One of the questions addressed to the referees was to determine the burner to be employed in testing the gas for illuminating power. As appears from the report, the referees carefully examined the various kinds of burners in use, and also some new ones, and the result of their inquiries was the adoption of a burner submitted to them by Mr. Wm. Sugg, now known as "Sugg's New London Burner"—in all respects a beautiful instrument, superior to any hitherto invented.

In the referees report, the burners in use by the consumer are commented upon. How often has this subject been commented upon, and the unfortunate consumer, after trying burner after burner, drags on his life in a state of semi-darkness? He has gone past complaining, and has a belief that the fault is in the *gas*, not the burners, and that he is being victimized by the gas company.

It is therefore a matter of rejoicing to gas managers that the gas referees have probed this sore point—with a desire to heal it. Their inquiries revealed in an extraordinary manner the badness of the burners in common use; their investigations, as detailed in their report, show that some of the burners give barely 20 per cent. of the real illuminating power, and on inspecting various large establishments, the burners in use gave only 55 per cent. of the illuminating power obtainable from the gas. These facts prove in a remarkable manner how groundless has been the bitter outcry on the part of the public against gas companies. They show that the fault has really lain with the consumers themselves, who have been in the habit of wasting the gas supplied to them, and throwing away very large sums annually, by the use of shamefully bad burners. This is a point of great importance to the public, and it is to be hoped that one result of the publicity given to this report by the Board of Trade will be to lead consumers to adopt better burners, a change which will be greatly in their own interest, and which ought certainly to lead to a cessation, or, if that be hopeless, at least to a diminution of the outcry against the gas companies. At the same time let me point out to gas managers that it is their duty to assist consumers to a selection of burners. For years past I have done this, and we recommend Sugg's steatite burner and the slit fishtail as far preferable to the 2-hole fishtail. In a paper read by Mr. Sugg at our last meeting, on burners, the Brönner burner was mentioned as giving an illuminating power of 12 candles, with a consumption of 5 feet per hour. I have made some experiments with this burner, and am pleased with the results. These burners are all split or bat's-wing burners, and glasses are made to suit that description of burner. They are made of various sizes, from 1 to 8 feet. Mr. Greene, of King William Street, London Bridge, is the London agent for these burners, and they have given great satisfaction in places where they have been fixed. Mr. Sugg has also a new burner which contains in the socket a regulator, by this means you can with four sizes effect the same object as the Brönner burner with eight or nine sizes. A sample of both burners will be before you for inspection.

The last paper on my list is by Mr. Davis, introduced by Mr. E. White, of Birmingham, "On a New Form of Gas-Exhauster." The subject of gas-exhausters was discussed in committee, and it was thought that a practical trial of the working of the various known exhausters should be made, and that members should have ocular demonstration of the working. I think this was a step in the right direction. I am sorry the committee had not time to carry it out, but it may be borne in mind.

I believe I have now exhausted my stock of papers if I have not your patience, and I shall but just glance at two or three new introductions in the shape of valves. Who is there so fortunate as not to have been plagued with leaky valves, and what mischief have they not caused? I hope next session we shall have a paper on valves, and I would draw attention to Messrs. C. and W. Walker's new patent for improvements in centre-valves, "Cathels and Terrace's" patent four-way disc gas-valves, Mr. George Livesey's water-valve, Thorneloe and Co.'s patent flexible valves, and C. and W. Walker's slide-valves for large sizes. Messrs. Walker are manufacturing the centre-valves for the Beckton works. The centre-valves hitherto made by them were liable to leak from settlements of naphthaline and dirt upon their surface facings. Some of these deposits were of a slippery nature, so that the valves in turning slid over them, instead of throwing them off, and became leaky. Messrs. Walker's improvement overcomes this difficulty by means of casting surfaced bars, or covering facings, in the valve, which do not interfere with the passage of the gas, but always cover the surfaced facings of the partitions of the body, thus protecting that part from injury of every kind, and rendering the valve perfectly tight. A gentleman will be in attendance with a model and drawings for the inspection of members; he will also exhibit a drawing of the new wedge-valve. The valve itself is no longer a disc plate with a spring behind, but a rigid solid wedge of cast iron, having two perfectly surfaced facings fitting the facings inside the body casting; it is worked by a

powerful screw, and is said to be perfectly gas-tight. Messrs. Cathels and Terrace's are improvements on their well-known four-way gas-valves, and consist of a simplified arrangement of the gas-ways through the valve, reducing it in size and weight, the ports being now all on one level, the disc being actuated by one movement, instead of two, as formerly; and last, though not least, by the impossibility by this arrangement of accidentally shutting back the gas, because the closing of one gas-way simultaneously opens another. The principle will be easily understood by an inspection of a model of the valve on the table. Mr. Livesey's water-valve differs entirely from the old water-valve. It is very simple, but no doubt very effective. It has no facing, springs, or wedges to get out of order, and is easily worked. I hope Mr. Livesey will have a drawing of it with him to explain it. I look upon it as a valuable invention. Messrs. Thorneloe's valve appears to be an adaptation of the principle of Morton's retort-lid, and will, no doubt, do very well for small mains.

A few words in conclusion. I make no apology for the length of my address, feeling, as I do, that I have only touched upon those points which seemed to demand your attention and my recognition; and however dry to our visitors some of the subjects may be, they are all of importance to gas managers, whose duty and interest it is to perfect themselves in every department, to keep alive to all new inventions or improvements, so as to secure any benefits which may arise therefrom to their respective companies. If I have failed to condense the matter I have laid before you, that I grant is a fault, although, perhaps, a fault more honoured in the breach than the observance; for I would much rather repeat myself than fail to convey to you my full meaning; but, under any circumstances, I cannot but express to you my thanks for the kind attention you have bestowed on my remarks. It leads me to hope that they have not been destitute of merit, and if so, I trust some little good may result from them.

GAS MANAGERS BENEVOLENT FUND.

Mr. Warner moved the following resolution, of which he had given notice:—"That a gas managers benefit-fund be formed for the relief of deserving members who may be incapacitated by old age or sickness from discharging their duties; and that a sub-committee, consisting of the president, ex-president, and president for the coming year, be appointed to consider the best means of giving effect thereto, and to report to the next annual meeting upon the formation of such a fund." In doing so he said that while he deeply regretted the painful circumstances under which the association was deprived of the services of Mr. Esson on this occasion, he felt gratified in having to submit his motion to a meeting presided over by a gentleman whose name appeared as one of the contributors to the benevolent fund of the Institute of Civil Engineers. He trusted that he should be able to show, in the few remarks he was about to offer, that it was a matter of great importance such a fund should be established in connexion with this association. The subject had frequently been brought under the attention of gas managers, not only at the annual meetings of the members of the association, but in the pages of the Journal of Gas Lighting. As a body they were behind their subordinates in the creation of a benefit-fund, and he might mention that some time back, being desirous to establish such a provision for the sick and infirm among his own workmen, he found that nearly all of them were members of some society having that object in view. Among professional men, too, the necessity of a benevolent arrangement, such as he hoped the gas managers would feel it their duty to undertake, was extensively recognized, and amongst solicitors and civil engineers two such organizations had for some years been successfully in operation.

Mr. Goddard said the subject brought under the attention of the meeting by Mr. Warner was a very important one, and fully deserved the consideration of the association. But, looking at the short time available for discussion at these annual assemblies, it was scarcely possible to go fully into it. He thought the better course would be to refer the question to a committee to go into the details, and bring up a report to the next meeting.

Mr. G. Livesey seconded this proposition, and

Mr. Warner assenting, it was resolved—"That a committee, consisting of Messrs. G. Livesey, Morton, Brothers, Malam, Wood (Bury), and Wood (Hastings), be appointed to consider the subject, and report thereon to the next annual general meeting."

Mr. Cathels read the following paper:—

ON SETTING AND WORKING RETORTS.

"On the proper mode of setting the retorts the prosperity of a gaslight establishment mainly depends." Thus wrote Mr. Peckstone, in his treatise on the manufacture of gas, 30 years ago, and even now, after the additional experience of all that time, Mr. Peckstone's penetrative assertion is as applicable as ever; for in the somewhat multifarious duties of a gas manager there are certainly none more important than the setting and working of the retorts. When it is borne in mind that the expenses directly connected with this part of the process of manufacture—viz., coals, and labour carbonizing them, fuel, and retorts, absorb on an average from 60 to 75 per cent. of the whole cost of manufacture and distribution, and that the amount of each of these items depends to a considerable extent on the attention given to and the degree of skill exercised in the retort-house arrangements, the necessity for a manager being thoroughly efficient in this essential part of his duties is sufficiently obvious. Indeed, I think it may be accepted as an axiom, that (other things being equal) as are the retort-house qualifications of the manager, so will be the success of the concern with which he is connected. But whether this be agreed with or not, the question is, at any rate, of sufficient importance to profitably engage the attention of this association.

I shall not presume to occupy the time of the meeting by attempting to enumerate the difficulties experienced with the retorts in the early days of gas lighting, owing to the inconvenient modes at first practised of setting them, before the method was ultimately adopted of placing them horizontally in arches or ovens, or of the various fantastic and more or less impracticable schemes that have since those days from time to time been proposed, or tried and abandoned; because the ingenuity displayed in this direction—sometimes with valuable results, but far oftener otherwise—is pretty familiar to all of us, and is, at any rate, beside the purpose of the few observations here offered, which are to briefly bring the subject before the meeting, with the object chiefly of eliciting the views of such of the members as may favour the meeting with their experiences, so that instruction and benefit may result from the discussion thus provoked.

Cast iron was at first the only material available for retorts, but their rapid destruction, from being exposed unprotected to the direct action of the fire; must have been such a costly matter, that the necessity of protecting them in some way seems soon to have forced itself on those engaged in struggling to overcome the difficulties incidental to this entirely new branch of industry.

Fire-clay tiles were then introduced with great advantage as guards for the retorts, and the number of retorts in a setting or bed was gradually increased to five, which seems to have been generally regarded as the most advantageous. From fire-clay bricks and lumps being used in setting the retorts, the next thing that was likely to suggest itself was the building the retort itself of these materials. And this decided step in advance was taken by Mr. Grafton in the construction of his fire-clay oven, patented just half a century ago. But the substitution of fire-clay for iron retorts was but a slow and gradual process. Nor is this to be wondered at when it is considered that iron retorts, although a costly item, through their requiring to be frequently renewed, had the immense advantages over those of fire-clay, of being absolutely gas-tight, which the latter in their then comparatively imperfect state of manufacture were far from being. And the irons had the further advantage of not filling up with carbon to anything like the same extent as the clays, consequent on their porosity, roughness of finish, and the head of water against which they had to work for want of an exhausting apparatus. But now, when the pressure is removed by exhaustion, and when the manufacture of clay retorts has attained to such a superior state of finish, the advantages are, I think, wholly and indisputably on their side. As regards first cost, a properly constructed clay setting is less than half that of an iron one of retorts of equal size. The durability of a clay retort is—or ought to be—never less than at least twice that of an iron one; while the fuel account for equal productions of gas is quite as favourable with clay as with iron settings. The life of iron retorts, when worked at a proper temperature, may be taken at about ten to twelve months. By working with low heats they might be made to last a few months longer, but the additional longevity obtained would be at the expense of their usefulness. They would make no more gas—and I will venture to say no better gas—in the longer than in the shorter time with better heats and heavier charges. I have been favoured with the results of iron settings in a well-managed works—the manager being a member of this association—where iron retorts were used until within the last few years. The settings were five D retorts 20 inches wide by 12½ inches high, and 8 feet long in a bed. They were set on as good a principle, I think, as could have been adopted, and were altogether a very favourable specimen of iron settings. The total average production of each retort was a little under a million and a half cubic feet, but if we take the production in round numbers at that quantity, we shall have, I believe, iron settings working under the most favourable conditions, and with the best results; because less than two-thirds of that quantity has been generally found to be the extent of their productive power. In addition to the rapid perishability of iron retorts at temperatures that do not injuriously affect clay ones, there used to be the further disadvantage—especially in the case of the width of the retort being larger in proportion to its height—of the crown "dropping in;" but this evil has been obviated, I understand, by the strengthening ribs introduced a few years ago by Mr. Fraser, of Colchester, and iron retorts so improved have since their introduction been, I am informed, used to a considerable extent both at home and abroad.

But although the almost universal experience of the gas world has emphatically pronounced against iron retorts as set in the usual way by themselves (except in some few special cases, such as very small works, where the retorts cannot be charged regularly, or kept at a uniform heat, and where, therefore, iron ones are perhaps more suitable than those of clay), they have for many years been used in combination with clays; sometimes in the same arch or oven with the clays, and in other instances set by themselves in a separate arch, but always arranged for the clays to receive the first of the heat. In this application the iron retorts are not usually protected by any covering, and if the principle be not carried too far—that is, if the number of iron retorts be not out of proportion to the clays—they may be entirely heated, or at any rate materially assisted, by the waste or partly spent heat, after leaving the clays, and before passing to the main flue. In these settings the irons require to be so arranged that their outside surfaces can be cleaned with facility, and this I found, from seven to eight years experience of the system, requires to be done about once a week. This combination seems to have been first adopted by the late Mr. George Lowe, who, according to the drawing in "Clegg," had the two bottom retorts of iron in a bed of five, the other three being of clay. The retorts were so set that the irons could be renewed without disturbing the clays. Messrs. Robinson, of Leicester, appear to have worked a somewhat similar system for many years, their arrangement being a bed of six D retorts, the two top ones only being clay, and the other four iron, the sides of the irons next the furnaces being protected in the usual way of ordinary iron settings. There appears from the drawing (also given in the last edition of "Clegg") to be the same facility for renewing the irons without interfering with the clays, as in Mr. Lowe's arrangement. But in this case the number of iron retorts are so disproportionate to the clay ones, that the spent heat of what would be sufficient for the latter alone can have but an inappreciable effect in heating them. They otherwise, too, so closely resemble an ordinary setting of iron retorts as to be fairly regardable as such, rather than a combination of iron with clay retorts, as usually understood, for the purpose of utilizing the waste heat from the clays. Mr. Croll also, as is well known, worked a combination of clay and iron retorts, which he patented so far back as 1844. He had three different arrangements to suit works of different sizes. The arrangement for the smallest sized class of works for which the combination was suitable consisted of four or five retorts set in a 6 feet wide arch. The furnace was placed at one side, over which there were two clay retorts, through which the heat first played, and was then drawn down through two or three iron ones, and passed to the main flue by a flue under the bottom retort. To suit the next larger class of works there were nine retorts—viz., four clays and five irons, set in an arch about 11 feet high, the clays being all above the irons, and worked from one floor level (in which the furnace was set), while the irons were worked from a lower floor at the back of the arch, the mouthpieces of the clays being at the front, and of the irons at the back of the arch. The heat, after leaving the clays, passed down through the irons to the main flue, under the floor of the arch. The system again for the largest class of works, as is well known from the publicity given to it at the time of the establishment of the Great Central Gas-Works, and the extensive application of it both there and at the Surrey Consumers Gas-Works, during the time of Mr. Croll's connexion with both concerns, was the double arch with stage system, except that the lower arch was set with iron retorts instead of being empty, and merely carrying the arch and retorts above, as in the ordinary application of the stage principle. The furnace was on the stage line in the usual way, and like the modifications already described, the gases generated in the furnace, after playing through six or seven clay retorts, descended through nostrils in the crown of the lower arch, and then through seven or eight iron retorts, finally passing under two or more of the bottom retorts to the main flue, placed in this, as in the other cases, under the bench. In each case the clay retorts were circular in section, and 15 inches in diameter, and the iron ones were of the D shape, 12½ inches by 12½ inches, and set without any protecting tiles, to enable them to get the full benefit of the partly spent heat. These settings were, in my opinion, open to the same objection as those of Messrs. Robinson—viz, that there were too many iron retorts in proportion to the clays to secure the economy sought, and being through or double-length retorts, there was not sufficient room for an ascension-pipe at both ends of each retort, involving the serious objection of causing the gas generated near the end, without the exit-pipe, to pass along the whole length of the retort before escaping. There was also the further objection of not being able to separate the clay from the iron bed, so that the letting down of the irons required the clays to be let down too.

Mr. George Anderson's applications of the combined principle have certainly been the most successful, the reason chiefly being, in my opinion, that he subordinates the iron retorts to the clay ones. The number of irons are but half those of clay, instead of being an equal or even greater number, as in Mr. Croll's system. There is also in each of his modifications the power of shutting off the iron retorts when required with facility, by merely altering the dampers of the iron and clay beds. For the smallest sized works, three retorts are set over each other in a narrow arch, so arranged that only two or all the three can be worked as required. For larger works the arrangement consists of setting nine retorts in an arch from 7 feet 6 inches to 8 feet 6 inches wide, according to the size of the retorts. The six retorts that surround the furnace are of clay, the remaining three, placed at one side of the arch, being of iron. The heat from the furnace acts first on the clays and then on the irons, in the usual way of

such combination. For the largest sized works, again, the retorts are set in three separate but adjoining ovens, the two outside ones being set with clay retorts, and having a furnace each (one of which is usually, though not necessarily, a tar fire), and the middle one with irons without a furnace. Each bed is provided with a separate flue, which enables the bed of irons to be heated or not as desired.

I, also, for some years worked an arrangement whereby the waste heat of each bed of seven clay retorts passed through, among, and effectually heated the retorts in an adjoining oven without a furnace, containing three retorts placed over each other. This oven was 30 inches wide, and was at first set with three iron retorts of the D shape, 15 by 13 inches, with rounded corners, the bottom one being set on a close floor of fire-tiles, and each of the upper two simply carried by four 12-inch wide tiles, placed at equal distances apart, and supported by corbels springing from the side walls of the oven. But it was found the bottom retort burned out before the other two, notwithstanding its being protected by the fire-tiles. A clay retort was, therefore, set in the bottom instead, the upper two only being of iron. As there was a direct communication from each bed of clays with the main flue, in addition to that with the bed of irons, it was only necessary to shut the damper of the iron, and open that of the clay setting, in order to shut the bed of irons off. The arrangement worked very satisfactorily, but the gentleman who has now charge of the works in which I had these double settings erected, has considered it better to dispense altogether with the iron retorts, and to substitute clay ones, still heating them from the adjoining bed. He informs me that he has no difficulty with them.

The important question of utilizing the waste heat from clay retorts by means of blank iron settings is one that I am not prepared to argue very strongly one way or the other. There are so many things to be taken into consideration, that what might be the proper course to adopt in one place, and under one set of circumstances, might be injudicious if carried out in another place, and under totally different conditions. The question resolves itself into whether the value of the fuel saved outweighs the loss of the somewhat diminished production of gas in the iron retorts, and the cost of their more frequent renewal. But in estimating the relative costs, the greater durability of iron retorts in this arrangement than when set over a fire, owing to the absence of cutting draughts, must not be lost sight of. My opinion is that where the demand for coke is good, and the price per ton obtainable averages, say, not less than three-fourths the cost per ton of coal carbonized, iron retorts may be used advantageously, combined with those of clay, as set in the ordinary and often imperfect way. This advantage would hold good to a greater degree, I think, when the retorts happen to be built of bricks, and more so still where brick ovens are used. Wherever this combination is adopted there is an entire absence of flame from the chimney-top, which is too frequently to be seen on a winter night from gas-works chimneys, often resembling more a smelting-furnace than what a retort-house chimney should be, and representing, one is afraid to say what value of fuel utterly and literally thrown to the winds.

But when the retort-house arrangements are efficiently conducted, there is, I think, but little need for supplementary iron retorts. If the art of retort setting and working be properly understood, and carried into effect, not only will the spent furnace gases that pass to the chimney be but of inappreciable value, so far as further retort heating is concerned, but the retorts, by obtaining the maximum effect of the heat generated in the best possible way, will produce a great deal more gas during the time they are in action than is usually obtained, with a very important saving over the average fuel accounts.

But whether the spent heat from good clay settings be sufficient or not for heating iron retorts, it is at any rate amply sufficient for generating steam, where there are, say, four or five beds in action. Utilizing it thus is no new idea, but I am not aware that the application has ever been so entirely successful as Mr. Upward, of the Chartered Gas Company, has made it. That gentleman has employed the system in several places very successfully. The arrangement is perfectly simple and manageable, and could be advantageously adopted even in small works, because the want of sufficient heat during the summer months would be no inconvenience, steam not being then required; but in the winter time when it is needed the greater number of retorts in action would supply the required heat.

Of the three kinds of fire-clay vessels used in gas-works—viz., brick ovens, brick retorts, and ordinary retorts in whole lengths, or in convenient lengths for jointing together—their efficiency, I think, may be taken in the inverse order here given. Brick ovens, if justifiable at all, can only be so, it seems to me, where coals are very cheap, and coke valueless. They are beyond all doubt the most inefficient appliances for gas-making, and although highly creditable to the inventor, as being a great advance on the processes then in use by introducing fire-clay as a substitute for iron, are surely inexcusable now. Everything is against their use except durability, which might have been some plea in their favour when retorts cost from 10s. to 12s. per foot run, but now when they can be obtained, in a greatly improved condition to what they were in those days, at less than half these prices, it seems to me that this, their only recommendation, is obtained at a ruinous price. They do not make so much gas per ton of coal carbonized as retorts do; they do not produce the same quantity of gas in the same retort-house floor area that good settings do; they are wasteful in drawing and charging; and the fuel required to get at all a satisfactory production of gas from the coals is enormous. I do not think there will be any exaggeration in saying that the oven system requires at least 25 per cent. more coke for fuel than suffices for retorts in fairly average settings, to produce an equal quantity of gas, and I have heard of cases where considerably more even than that was used. But taking the extra coke required for an oven over a bed of retorts at but 20 per cent. by measure, and assuming that such a setting of retorts requires a chaldron of coke per 12 hours, equal to 24 sacks—say 25 cwt. per 24 hours—and reckoning the selling price of coke at but 10s. per ton, there is a loss in money value of 17s. 6d. per week, sufficient to renew a bed of seven retorts at £6 per retort every eleven months; so that apart from the other serious evils of the oven system, this economy of duration theory utterly breaks down. In this comparison I have taken fair average settings, and, I believe, put everything favourable for the ovens. If the comparison be made with settings that make more gas per retort, and with a considerably greater economy of fuel than here given, the case is, of course, still worse for the ovens. Nobody who wants to generate steam quickly would now think of applying heat merely to the outside of a boiler of large diameter. To attain that object flues are made through the boiler, so that the mass of water to be acted on is broken up and brought into more direct contact with the heat applied, and one would think that a little reflection would show that the same principle should be applied to the vessels used for the generation of gas. The oven is the boiler without flues; a bed of retorts is the boiler having a number of flues. In the one case the flues heat in the surrounding medium, in the other they are heated by the surrounding medium; and it seems to me that using ovens for distilling coal is only less absurd in degree than would be the employment of an old-fashioned waggon boiler for generating steam quickly.

Next in order, and in my opinion occupying an intermediate place in utility between the antiquated brick oven and the modern clay retort, comes the brick-built retort. The advocates of these retorts, like those of the ovens, fairly claim for them a greater durability than the ordinary retort; but when this has been conceded, it seems to me that nothing more can be said of their superiority, while in some points they are certainly inferior to the ordinary retorts. The question is not merely whether a setting of brick retorts lasts longer than a setting of the ordinary clay ones, but which of them, all things considered, are on the whole the more advantageous. The first cost of a setting of these brick retorts, and the annual cost of repairs, are as nearly as possible the same as for the setting of ordinary retorts of the same number and capacity, but their duration (with the renewal of the retort over the fire in a bed of seven) extends, I am informed, to four years, or a little over, contrasting favourably in this respect with ordinary clay retorts. The production of a D-shaped retort, 15 by 13 inches, and 9 feet 9 inches long, or 19 feet 6 inches from mouth to mouth of a through retort, is 5000 cubic feet per mouthpiece per 24 hours from Newcastle coals with the usual admixture of cannel. These particulars have been given to me for this paper by a member of this association, who is the engineer of very large works where these retorts are used; and you may take it that his results are the most favourable possible with this class of retorts, because the establishment with which he is connected is one of the best managed and most successful in the kingdom. The objectionable thing about these settings—viz., the fuel they require—outweighs, in my opinion, the advantage of their greater durability. They require 28 to 30 per cent. of fuel, as usually reckoned, or, in other words, every 100 tons of coal carbonized requires the consumption of 28 to 30 chaldrons of coke. But this is about 8 to 10 per cent. more than is in some works found necessary for similar settings of ordinary retorts, and at least twice what suffices for settings of seven oval retorts arranged as shown on the drawings exhibited, and which in the ordinary every-day way of working produce from 10 to 15 per cent. more gas than the brick retorts do. Now, assuming the extra fuel required over settings of ordinary retorts to be but three sacks of coke for each fire per 12 hours = six sacks per 24 hours, there is thus for each through bed an extra consumption of a chaldron per 24 hours. This, at say 7s. 6d. per chaldron, amounts to £2 12s. 6d. per week—sufficient to renew the retorts every eight months. Or, taking the life of ordinary retorts at two years, the saving in fuel alone in that time would not only pay for the renewal of the entire setting, but would leave a surplus in addition of £189, being nearly £100 per annum per through bed of retorts. In this estimate I believe the disadvantage in this respect of the brick retort system to be rather understated than otherwise, but if only half the above amount be taken as correct, there would, over and above renewing the retorts, be still a loss for fuel alone over ordinary clay retorts of about £50 per through bed per annum. It is true that in many places the fuel for ordinary settings is as heavy, and in some instances even heavier, than that here given for brick retorts, but that only denotes want of time, or attention, or skill on the part of those having the management of the carbonizing. In these cases the evil can be cured, if the proper means be adopted; but with settings of brick retorts I do not think any appreciable improvement can be made on the above results.

The degree of success in carbonizing with clay retorts depends on several conditions, but chiefly on the following—viz., on the quality of the retorts, on their form, on the degree of skill exercised in setting them, and on the way in which they are worked and used. That "the best is the cheapest" is a maxim especially applicable to a retort, and it is hardly necessary to say that its worth depends both on the quality of the clay of which it is made and on the mode of manufacture. I prefer a well-burnt retort, even although it may detract a little from its finished appearance. Retort manufacturers are often sadly pushed for time in the execution of the orders sent to them, and it is hardly, therefore, to be wondered at if retorts are sometimes delivered in but a semi-baked condition, requiring the gas companies that use them to do work that should be done before being delivered, thus giving the makers additional kiln room, and lessening their fuel and labour accounts. The form of the retort is a material element as regards both its durability and the facility of working it. The nearer the circular, the greater the strength; the less unequal is the expansion and contraction; the less injuriously is the retort affected by the furnace flame; and the greater ease is there in drawing the charge. Next to the square or oblong section, the D shape—for which there seems to be an unaccountable preference, especially in country gas-works—is the very worst. The unequal contraction and expansion, owing to the corners of the retort, is alone sufficient to condemn it. But even that is unimportant compared with the rapid destruction of retorts of this form owing to the corners getting burnt away. This evil effect is so obvious that it hardly requires mentioning, and I hope this meeting will be favoured with some more satisfactory reason for continuing their use than has hitherto been advanced. The natural result of the use of this kind of retort is seen in the recently published "Gas Manager's Handbook," by Mr. Newbigging, where the duration of an ordinary D clay retort is given as equal to the production of about a million and a half cubic feet of gas. Now, if this statement is anything like reliable, and I see no reason to doubt its accuracy, I have no hesitation in saying that such working is simply playing at gas-making. Respecting the facility of drawing and charging, any stoker who has worked round or oval and D retorts will tell you that he would as soon draw three of the former as two of the latter. In the round or oval shapes the coke slides into the centre of the retort and to the drawing-rake, whereas with retorts of the D shape a portion falls away into the corners, requiring the more frequent insertion of the rake, and consequently additional time and labour. In addition to the form of the retorts and the arrangement of their setting, a good deal depends, both as regards the economy of fuel and the duration of the retorts, on the way they are worked and managed. The minimum draught requisite to keep them sufficiently hot must be ascertained by gradually opening or closing the damper until the proper draught be ascertained, and this should not afterwards be exceeded. Again, a good deal depends on the skill in repairing the retorts. I have seen retorts condemned as worn out that might have been easily repaired by a little contriving, such as the shifting, or adding, of an arched ring or two to form a backing against the bad places, that could have been done at a trifling cost, and would have made the retorts equal to another season's work.

In the arrangements for working the retorts it used to be customary to draw and charge a whole bed at once. I do not know whether this is still done anywhere; if so it would be found advantageous to abandon the practice. The result is the lowering of the temperature of the retorts to a greater degree than when only a part of the setting is charged, and this, too, at the time it is most required to be kept up. A convenient way is to reciprocally charge half the number of retorts in the bed when the charge in the others is half off. There not being then such a rapid absorption of the heat by the retorts containing the half-spent charge, the fresh charged ones get the benefit, and thus a kind of self-acting adaptation of the heat to the condition of the charge is effected, and better results, both as to quantity and quality of the gas, produced. It is true that the injurious effect of charging a whole bed at once does not hold good to the same extent with clay as with iron retorts. Still it is an evil, and is just one of those apparently unimportant details, the due attention to or neglect of which go far towards accounting for the greater or less success of any industrial pursuit. There is the less reason, too, for this custom, because its abandonment entails no additional labour or inconvenience, but is, on the contrary, especially where the scoop is used, a matter of convenience and comfort. I have understood that Mr. Kirkham, when engineer-in-chief to the Imperial Gas Company, was the first to abandon the old and defective system of working retorts.

There are three conditions in retort-setting essential for their successful working—viz: First, to so arrange the course of the furnace gases that heat will be imparted, not only to all the retorts in the bed, but also to the whole length of each retort as nearly as possible alike; second, that the brickwork be so contrived as to give the required support to the retorts at the greatest number of points, with as little actual covering of the retorts as possible, and without interfering with the free play of furnace flame; and, third, that the retorts be

set sufficiently close together. When these conditions are thoroughly understood, Newcastle gas coal may be carbonized without any difficulty, with an expenditure of coke for fuel not exceeding from 10 to 15 per cent. in the usual way of computing such account, and with the production of from 38,000 to 40,000 cubic feet of gas per 24 hours on a retort-house floor of 81 feet super., including division walls between the ovens in which the retorts are set; or, in other words, in an arch 7 feet 6 inches wide by 9 feet long, with 18-inch division, or party wall. Round and oval retorts need not, and ought not, to exceed 3 inches in thickness; and I may here parenthetically observe that this is one of the advantages of having retorts of these forms. When the strength or resisting power of the retorts is diminished by their having angles, it is usually found necessary to have them made 4 inches or even 4½ inches thick. The retorts I prefer are 3 inches thick, with an additional inch at the swell or flange at the mouth, for the mouthpiece bolts, and they are set with the flanges touching all round, which leaves 2-inch flue spaces between them. By this means the furnace gases are, so to speak, squeezed into a thin sheet, and are thus elongated in the lengthway of the retorts, and, spreading over and rubbing against the retorts, are readily deprived of their caloric. It is often considered one of a gas manager's chief difficulties to keep his retorts hot, and not without reason as retorts are sometimes set. They do not get a chance of heating with an ordinary consumption of fuel. In cricket parlance, the stumps are set so wide apart that there is no getting the bails off, and unnecessarily large balls have to be resorted to in consequence. As one having paid some considerable degree of attention to this question of retort-setting, I would respectfully counsel "wide-stumped" gentlemen, should there be any present, just to make one trial of moving their "stumps" a little closer. The products of the furnace, like those of the retorts, will pass where there is least resistance, and the great bulk will find their way to the chimney unused if the retorts are too far apart, so that one of two things must happen—either the retorts are not properly heated, or an excessive volume of furnace gases must be passed through the bed to effect that end, requiring, of course, an unnecessary consumption of fuel. As to the way in which these products pass through the bed, it will be found that making them pass alternately up and down is more effectual than what is called a "running heat," that is, playing longitudinally. Where there is a retort placed over the furnace, as in some of the drawings exhibited, it is sometimes found difficult to prevent the protecting arch from dropping. This is a difficulty that need never occur if bricks be used that will stand the heat. The reason is simply bad workmanship—too thick joints and the bricks not properly rubbed together. This, at any rate, ought to be an unknown difficulty where the red Ewell bricks are used, because, being as friable as a household bath brick, they can be easily rubbed surface to surface, and the arch built without the employment of any cement at all, if preferred, and being composed largely of silica, they are infusible by the greatest furnace heat.

It is considered a matter of great importance with some gentlemen that all the coals delivered into the retort-house be wheeled over a weighing-machine and weighed; and I have heard it referred to with evident self-satisfaction, as being the proper thing to do—as being, in fact, a cleverly devised kind of tell-tale for keeping the stokers up to their work. There is a given weight to go into each retort per 24 hours, and therefore the coals weighed into the house must be equal to such given weight per retort, multiplied by the number of retorts in action, multiplied by the number of charges. Now, I am sorry to have to say anything disrespectful about such a (generally) harmless hobby as this; but truth compels me to observe that I think its utility is on a par with the other innocent amusement of peeping into the bed through cast-iron boxes with moveable lids built in the front wall for that purpose, the ostentible object, I presume, being to enable the manager to ascertain if the heats of the retorts are satisfactory. This perennial peeping observance is discharged by some of its devotees with a scrupulousness worthy of a better cause, and highly suggestive of fire-worshipping, or, at any rate, of conviction that it is essential for the proper and conscientious performances of one's duties. Well, I cannot say I am sceptical as to this doctrine, because I have no doubts on the matter. I know (and I have already endeavoured to explain why) that wherever there is room between the retorts for indulging in these playthings, there is unquestionably something radically wrong with the construction of the setting; and I have almost invariably found that their concomitant is the presence of rich hydrocarbon vapours in the neighbourhood of the tar well. But it is an ill wind that blows nobody good. These same sight-boxes are worth, I was going to say, their weight in gold to the fortunate tar distiller. I have a strong conviction that all this coal-weighing and sight-seeing is, to say the least of it, supererogant. A manager can always satisfy himself, by a glance at the production per retort in the carbonizing book every morning, whether things are going on satisfactorily in the retort-house; and this part of his duties, at any rate, ought not to be omitted. If there has been a proper make per mouthpiece for the preceding 24 hours he may rest quite satisfied; if otherwise, looking through a sight-hole, at any rate, will not mend matters. The public, we all know, have a settled conviction that the meter goes round by itself, apart from any consideration of the motive power of the gas—that it is, in fact, a disagreeable kind of solution of the perpetual motion problem; but gas managers, being more enlightened, ought to have faith in the fact that the retorts will not make the desired quantity of gas, unless there be sufficient coals put therein, and the heat be equal to its distillation.

It is scarcely necessary to discuss the question of stage *versus* ground-floor for working the retorts from, because the stage system is almost exclusively confined to London and its neighbourhood. The advantages claimed for this system are, as far as I understand, that the barrowmen do not require to go out of the high temperature of the retort-house, in cold or wet weather, in wheeling out the coke, that the coke drops down out of the stoker's way in drawing, and that extra storeage for it is obtained. But, if I may have the temerity to say so, these advantages are so dearly bought, and are so equally balanced by disadvantages, that it seems to me that the system is only justifiable where sufficient yard room is not procurable. The question of the barrowmen's comfort could easily be met, if desired, by covering in the coke-ground with an open shed. As to the additional storeage room obtained, it would, even if the whole space could be filled up to the stoking-floor, be but a mere bagatelle in cubic capacity. But that cannot be done, or anything like it. Indeed, the whole of the floor cannot even be covered with coke, and on no part of it can there be such a depth as to sensibly affect the yard storeage. And to obtain these nominal advantages the retort-house walls and chimney, or chimneys, have to be carried the additional height of the stoking from the ground floor, with more expensive foundations. There is the extra cost of the stage or stoking-floor, while the number and consequent cost of the arches or ovens is just doubled—that is to say, for each effective arch set with retorts there is another one of equal size built for the express purpose of supporting the former, and which is otherwise almost useless. Nor is this serious and otherwise avoidable first outlay the only disadvantage. The coke is unnecessarily smashed in falling so far, and, after all, it has to be handled quite as much, if not more than if it were drawn out of the retort into a barrow, and wheeled on to the coke heap in the yard at once. Men have to be kept below to quench and remove it out of the way of the next charge; after that they fill it into sacks, and in some places actually carry it outside to the vans. And over and above all this, practical men, like those I have the honour of addressing, will readily understand that with a space of more or less width between the front of the stage and the retort-bench, and with the furnace-bars usually below the stage level, there cannot be the same facility in working as on the ground floor. Again, the proportion of the coke required for fuel must either be prevented from falling on to the floor below in drawing, or it must be carried back again. So that, all things considered, I for one fail to see any appreciable advantage in the stage system.

As to the question of furnace combustion, which plays such an important part in gas-making, I have left myself but little time to speak. Moreover, it is a question of sufficient importance for a separate paper, and one that I hope some member of this association will take up and treat at next year's meeting. Where coke is used as retort fuel, there is comparative immunity from trouble with this question, but it is otherwise where coal or tar is used for that purpose. In the former case complete combustion is easily ensured, because not only is there but one element to be dealt with, but from the coke being in large pieces the fire-bars can be set wide enough apart to give ample area for the admission of air, while the portion of the coke next the furnace-bars, by its open porous nature, acts as an admirable filter or sieve, breaking up the air into finely divided threads, and so bringing each atom of carbon into immediate contact with its equivalent of oxygen. But where coal is used, especially small coal or slack, requiring the furnace-bars to be kept very close, perfect combustion becomes a much more difficult matter, because the elements into which the coal is resolved require each its own equivalent of air. To quote an extract from Wye Williams, "Each pound of good coal will give out 5 cubic feet of gas, and require for its special use 50 to 60 cubic feet of air, according to the quality of the gas; while the remaining coke, being about 50 to 60 per cent. of gross weight of the coal, will require about 100 to 120 cubic feet. The products from each hundredweight, then, in round numbers, will be as follows:—

Hydrogen	5 lbs.
Carbon in combination with the hydrogen, and forming gas	20 „
Carbon remaining as coke.	60 „
Nitrogen, sulphur, oxygen, and ashes . . .	15 „
Total	100

We here distinguish the three bodies into which the coal is resolved, and each requiring its own special equivalent of air—viz., the coke, the hydrogen, and the carbon of the gas. Now, the whole question of perfect or imperfect combustion—the utilization of all the elements of the coal, and obtaining their relative and entire calorific effect will be determined exclusively and absolutely by the facilities afforded these three bodies in obtaining their respective contact and quotas of the air supplied. It will not be enough, therefore, for engineers to look to the naked fact that each pound of coal will require 150 cubic feet of air, and to expect that all the contingencies of combustion will be satisfied if they provide that quantity. So far from that being the case, it is exclusively on the special application of these 150 cubic feet to these three separate portions of each pound of coal as above described that success will depend. For if the air be taken up by the incandescent coke (and to which it first finds access) more rapidly, or in greater quantities, than the gaseous matter can simultaneously be supplied with its own due quantity, the entire operation in the furnace will be deranged. In a word, the gas should have its own equivalent of air, and enter into combustion as rapidly as it is generated, and in due relation to the combustion of the coke in equal times." It will be thus seen that it is absolutely necessary to provide means for an adequate supply of air, in addition to what is drawn through between the furnace-bars, to obtain the full calorific effect of the fuel, and that the finer the supplementary supply of air is divided and commingled with the gaseous products of the coal the more perfect will be the combustion. And this is as indispensable for the proper combustion of tar as it is for coal. An efficient and convenient mode of burning tar is represented in the drawing of the six-retort setting exhibited. It is a copy of Mr. Anderson's tar fire, with the addition of a furnace below the sloping table, on which the stream of tar falls for the purpose of keeping it hot, so that the tar may be volatilized directly it comes in contact with it. Mr. Anderson effects this by means of the combustion in a chamber below of the resultant fine breeze from the tar itself. But I have found that the addition of the furnace saves a good deal of trouble in attending to the fire at the cost of but an insignificant consumption of breeze. It will be observed that finely perforated plates with sliding doors are built into the front wall for the purpose of regulating the admission of air. Tar cannot be burnt without destroying the retort placed over the fire before the others are worn out as they are usually set, but when arranged as in the setting of six circulars illustrating the tar fire, and also shown in one of the settings of seven ovals, this difficulty is entirely obviated, and tar can be burnt without undue destruction to the retorts, and without the production of smoke. I have burnt tar produced from both Newcastle and inland coals off and on for a good number of years, and the result of my experience is that, when consumed under proper conditions, it does the work of just about twice its weight of coke, or, in other words, five gallons of tar are equal in heating properties to a sack of coke. But whether coal or tar be used as fuel, there is no difficulty in ascertaining whether they are doing their work properly. The condition of the retorts will speedily show that, and there is in addition the tell-tale of the chimney-top. If there be an absence of smoke by day and flame by night, it may be taken for granted that the furnace combustion is satisfactory. In the larger gas-works in Scotland, the residue of the tar after distillation is used in a liquid state as retort fuel, sometimes in addition to coke, and sometimes by itself. I have seen it so used very efficiently both at Perth and Dundee. Mr. Whimster, of the Perth Gas-Works, has for many years burnt tar very successfully without any special furnace. It is merely run in over an ordinary coke fire by means of a small iron trough, in the old-fashioned way, the regulation of the air admitted by finely perforated iron plates above the furnace frame effecting complete combustion.

Mr. Siemens's regenerative gas-furnaces, which have been found to be so efficient and economical in fuel in some branches of manufacture where great heat is required, have been tried for heating gas-retorts, but I am not aware how far the application has been successful. Mr. White has tried it, I believe, to a limited extent, at the Windsor Street station of the Birmingham Gas Company, and I understand it is in operation on a rather extensive scale at the Paris Gas-Works. Like steam stoking, the process, I apprehend, is only applicable in large works. The apparatus is rather costly, requires a good deal of room, and is somewhat complicated. The late Professor Faraday, in his last public lecture at the Royal Institution, described these furnaces in the following terms:—

"The gaseous fuel is obtained by the mutual action of coal, air, and water, at a moderate red heat. A brick chamber, perhaps, 6 feet by 12 feet, and about 10 feet high, has one of its end walls converted into a fire-grate—i.e., about half-way down it is a solid plate, and for the rest of the distance consists of strong horizontal plate bars where air enters, the whole being at an inclination such as that which the side of a heap of coals would naturally take. Coals are poured, through openings above, upon this combination of wall and grate, and being fired at the under surface they burn at the place where the air enters; but as the layer of coal is from 2 feet to 3 feet thick, various operations go on in those parts of the fuel which cannot burn for want of air. Thus the upper and cooler part of the coal produces a large body of hydrocarbons; the cinders or coke which are not volatilized approach, in descending, towards the grate; that part which is nearest the grate burns with the entering air into carbonic acid, and the heat evolved ignites the mass above it; the carbonic acid, passing slowly through the ignited carbon, becomes converted into carbonic oxide, and mingles in the upper part of the chamber (or gas producer) with the hydrocarbons. The water, which is purposely introduced at the bottom of the arrangement, is first vaporized by the heat, and then decomposed by the ignited fuel,

and rearranged as hydrogen and carbonic oxide; and only the ashes of the coal are removed as solid matter from the chamber at the bottom of the fire-bars.

"These mixed gases form the gaseous fuel. The nitrogen, which entered with the air at the grate, is mingled with them, constituting about a third of the whole volume. The gas rises up a large vertical tube, for 12 or 15 feet, after which it proceeds horizontally for any required distance, and then descends to the heat regenerator, through which it passes before it enters the furnaces. A regenerator is a chamber packed with fire-bricks, separated so as to allow of the free passage of air or gas between them. There are four placed under a furnace. The gas ascends through one of these chambers, whilst air ascends through the neighbouring chamber, and both are conducted through ports at the end of the furnace, where mingling, they burn, producing the heat due to their chemical action. Passing onwards to the other end of the furnace, they (*i. e.*, the combined gases) find precisely similar outlets down which they pass; and, traversing the two remaining regenerators from above downwards, heat them intensely, especially the upper part, and so travel on in their cooled state to the shaft or chimney. Now the passages between the four regenerators and the gas and air are supplied with valves and deflecting plates, which are like four-way cocks in their action; so that, by the use of a lever, these regenerators and air-ways, which were carrying off the expended fuel, can in a moment be used for conducting air and gas into the furnace, and those which just before had served to carry air and gas into the furnace, now take the burnt fuel away to the stack. It is to be observed that the intensely heated flame which leaves the furnace for the stack always proceeds downwards through the regenerators, so that the upper part of them is most intensely ignited, keeping back, as it does, the intense heat; and so effectual are they in this action, that the gases which enter the stack to be cast into the air are not usually above 300° Fahr. of heat. On the other hand, the entering gas and air always pass upwards through the regenerators, so that they attain a temperature equal to a white heat before they meet in the furnace, and there add to the carried heat that is due to their mutual chemical action.

"Thus the regenerators are alternately heated and cooled by the outgoing and entering gas and air, and the time for alteration is from half an hour to an hour, as observation may indicate. The motive power on the gas is of two kinds: a slight excess of pressure within is kept up from the gas producer at the bottom of the regenerator, to prevent air entering and mingling with the fuel before it is burnt; but from the furnace downward through the regenerator the advance of the heated medium is governed mainly by the draught in the stack or chimney."

After describing the convenience and advantage of the process to various manufactures—such as glass-works, &c.—Professor Faraday concludes his lecture with the following figures:—

"Carbon burnt perfectly into carbonic acid in a gas producer would evolve about 4000° of heat, but if burnt into carbonic oxide it would only evolve 1200°. The carbonic oxide, in this fuel form, carries on with it the 2800° in chemical force, which evolves, when burning in the real furnace, with a sufficient supply of air. The remaining 1200° are employed in the gas producers in distilling hydrocarbons, decomposing water, &c. The whole mixed gaseous fuel can evolve about 4000° in the furnace, to which the regenerator can return about 3000° more."

The difference between heating retorts by this and the ordinary mode appears to be that by this plan a mass of coal is distilled or carbonized in a separate brick-built pit, the resultant smoke being consumed as fuel, any excess of air beyond what is required for their distillation being excluded: that the gases evolved are conveyed to the retort-oven (which in this application of the invention is the so-called furnace) by one passage or flue; that the proper proportion of air simultaneously enters by another flue, and that they there commingle and burn, instead of the requisite quantity of air for efficient combustion entering the ordinary furnace at once in the usual way.

But, in addition to this, a second part of the process, as has been already described, consists in the gases from the producer and the entering air being made to pass upwards to the furnace through the regenerators or chambers filled with chequered walls of fire-brick, which alternately take up the surplus heat from the used or departing, and give it up again to the entering gases or air.

Now I will not presume to offer an opinion as to the advantage or otherwise of the first part of the process—viz., the separate distillation of the coal and subsequent mixing of the gas therefrom with air, when applied to gas-works where, from special reasons, it is found to be more advantageous to burn coal than coke as retort fuel; but I think when the cost of the additional apparatus and having to purchase coal for the purpose are taken into consideration, it will not be thought an improvement where coke is used instead of coal. And as respects the second or regenerative part, looking at it theoretically, it does not appear to be worth all the extra cost or trouble in any gas-works. In applications where intense heat is required, and which do not materially lower its temperature, this mode of arresting the surplus and using it over again is, of course, of the highest importance. But the application to gas-retorts is very different; there heat of only a certain temperature is desirable or proper, and its enormous absorption by the retorts in converting their contents from the solid to the gaseous form, if properly utilized, reduces the temperature to about the same as it leaves the regenerators.

I have to apologize for having occupied so much of your time. If I have gone too much into detail in some of the matters touched on, my excuse must be my sincere conviction that no more important subjects than these same questions of setting, working, and heating retorts could engage our attention.

As respects the working of the retorts, I am glad that the remarks here offered are going to be supplemented by a paper on such an interesting question as the result of the application of steam machinery for that purpose, and that we are also to be favoured by another paper bearing closely on the subject in hand—viz., on the prevention of stoppages in the retort exit-pipes.

Of the drawing exhibited, containing thirteen different settings of retorts, from one to nine in a bed, suitable for all sized gas-works, I hope it will not be considered egotistical when I say that thay are not mere fancy plans that have never been tested, but are the selected settings of years of close observation and experiments, all of which have, therefore, been successfully proved. Although they are differently arranged to suit different sized works, it will be observed that one general principle pervades the whole. Part of this principle —viz., the particular mode in which the heat acts on the bottom retorts—I deem it proper to acknowledge to be similar to, and copied from, Mr. George Anderson's settings.

In conclusion, I may just further add that I am now working settings of seven 21 by 15 inch ovals, 19 feet long, set in a 7-feet 6-inch wide oven as per the drawings, and that they have produced, ever since they have been at work, an average of 11,400 cubic feet per 24 hours, with six-hour charges, equal to 5700 per mouthpiece, in the ordinary way of working, with an expenditure of fuel under 15 per cent. by measure as usually reckoned. These settings will produce during the life of the retorts an average of 5500 cubic feet per mouthpiece of 24 hours, and a total production per mouthpiece of 4½ millions, with an expediture of fuel not exceeding the per centage above named.

Mr. GODDARD said he had been very much interested in the paper just read, which he thought reflected great credit on the writer, who had gone very carefully into the question, and shown a number of instances in which the use of clay retorts could be advantageously adopted. The plan which he (Mr. Goddard) had followed at his own works was to have settings of seven retorts, partly oval and partly circular, set upon the principle recommended by Mr. Cathels. With regard to the plan of heating by Siemens's process, he believed it had been tried in various gas-works, but the amount of attention required in altering the current of air from one chamber to another, rendered it highly objectionable for general use.

Mr. G. LIVESEY said it was known to many of the members that at his works (South Metropolitan) brick retorts were used exclusively. He was bound to say that the writer of the paper had given the meeting very fairly and honestly a statement of all that had been done with respect to different methods of working, and when he brought forward the charge that brick retorts ran away with the fuel, it was difficult to contradict him. In fact, the 28 per cent. was a figure given by himself, but he did not think this was wholly due to this kind of retort, and he hoped in the settings he was now introducing to be able to reduce that amount of fuel down to 22 per cent. One point with respect to brick retorts Mr. Cathels did not mention, and that was not so much the question of their greater durability as to the time they lasted, but their non-liability to crack and become leaky. This was the principal reason why at the South-Metropolitan works they were exclusively used. It was found that they stood more rough usage in the matter of letting down and missing than other retorts. He was aware that during the last ten years, since they had discontinued the use of clay retorts, great improvements had been made both in the setting and working. Ten years ago they would only last eighteen months; now they might be made to last two years and a half of actual working time. At his works he had taken out eight brick retorts this year; the shortest duration of any of them was 47 months, and the longest 55 months, and these retorts had produced on an average 5000 feet of gas per mouthpiece. The heats were rather great, as they had been getting 10,000 feet per ton. To do that there must be an expenditure somewhere, and he found it better to have an excess of fuel than to lose 200 or 300 feet per ton in gas.

Mr. DUNNING said he was glad to hear Mr. Livesey's remarks, as he had not been aware that any London company were using brick retorts exclusively. At Middlesborough brick retorts had been used almost exclusively for the last fifteen years—there had been only one setting of fire-clay—and he could bear out all that Mr. Livesey had said. He believed that if gas managers would turn their attention more to brick retorts than they had done they would find great advantage from it. There were retorts of that class now at work in Middlesborough which had been in use for ten years, and were still turning out more than 5000 feet per mouthpiece, and doing their work well. They were repaired year by year at a comparatively trifling cost. The total make last year was 85 million feet, and the cost for repairs, taking into account the fire-clay and labour employed, was not more than £240.

Mr. G. ANDERSON said that, taken as a whole, he approved of the paper, but there were just two or three points in which he could not agree with the writer. He was an advocate for the use of clay retorts, brick retorts, or iron retorts, according to the circumstances in which they were employed. For a number of years he had used a setting which was almost identical with that shown in Mr. Cathels's drawings. When Mr. Cathels was manager for him at Dover he worked a setting of that kind, and that setting had been continued until a year or two ago. There were two large oval retorts on the level with the furnace, four circulars over, and three circulars on the top. The two circular retorts immediately over the furnace it was found very difficult to keep in position, because the fire shrank the brickwork, and sometimes melted it, and the retorts came down. He therefore took out those two retorts, and put in one brick retort, which made as much gas as the two together. The bottom arch of this retort was made the top of the furnace, without any protecting arches. This had been in action four or five years, and beyond the mechanical action of the coal and the rakes, it was nearly as good now as it was originally. To put an arch under would be a loss of material and of heat. One benefit in the use of brick retorts was the facility with which they could be repaired. Twelve months previously he took the bottom out of one and put in another without inconvenience. The first bottom was made of inferior bricks, which he removed, and put in Stourbridge. In taking out old settings of this class, many of the bricks could be advantageously employed again, not being liable as new ones to shrink. One point of importance which had not obtained the attention it deserved in Mr. Cathels's paper was the firing of the red-hot coke. It was not a new thing; it was well understood, but not generally practised, especially in large works, where some retorts were drawn at one time and some at another. He thought they should, as much as possible, take the coke from the retorts and put it in the furnaces. To throw the coke on the floor and quench it with water was absurd, and not creditable to their intelligence. By that means they filled the pores of the coke with water before putting it into the furnace to be cooked again, and it was not till the water had evaporated and a red heat was obtained that it began to do its work. The effect was to rob the furnace of a great amount of heat during the time. Mr. Cathels seemed to have come to the conclusion that there was no benefit from the heating of iron retorts after the clay. In that he thought Mr. Cathels was wrong, though he knew that clay retorts could not be heated at the minimum temperature at which iron could be heated for the simple reason that clay was a bad conductor.

Mr. BURGESS for a number of years had been working brick retorts exclusively, and found their duration more like fourteen years than four. He had some brick retorts now being repaired at Huddersfield which had been thirteen winters at work, and they seemed, to all intents and purposes, as good as at the commencement of their term. Mr. Cathels said he could not get more than two-thirds as much gas from brick retorts as he could from clay; but he (Mr. Burgess) found he could get as much from the one as the other. He was making 9500, and sometimes 10,000, feet per ton of coal; but he admitted that the expenditure of fuel was excessive, although he thought it arose, to some extent, from the mode of setting. In the Manchester Gas-Works they formerly used iron exclusively, then they used clay, and now they adopted brick retorts exclusively. They were setting them with two small retorts over the furnace, a large one over these two, and another large one above, and he believed they were economizing fuel very considerably.

Mr. KELSALL said he could confirm what had been said by Mr. Dunning and Mr. Burgess as to the use of brick retorts. At Ashton they had been used exclusively for the last sixteen or eighteen years, and some were now being rebuilt which had been at work for fourteen winters. He did not think the expenditure for repairs, including both tile and bricks, as well as men's wages, exceeded 39d. per 1000 feet. They had four-hour charges, and were obtaining 10,000 feet of gas per ton, but to some extent that might be accounted for by the use of cannel. His own opinion was that the small cost for repairs would far more than compensate the extra cost for heating. There were many advantages from the use of brick retorts in large works, and he could only account for their not being introduced into London gas-works by the want of ground room in consequence of the high price of land.

Mr. DOUGLAS (Newcastle) said his experience was against the system of repairing retorts altogether. He never could make as much gas out of an old retort as out of a new one; and therefore at the end of two years, if a retort lasted so long, he would take it out and replace it with a new one. He would never think of having a retort for fourteen years, nor even four years, on the premises. His opinion was more in favour of D retorts than round ones, and he believed in thick strong retorts (4 inch), and new ones every year.

Mr. WARNER said he believed that brick retorts had been used at the Chartered Gas-Works, and he had heard that in the London Company the consequence of the use of brick retorts had been to reduce the value of the shares from £100 to £5.

Mr. MEAD (Reigate) said he was certainly very much surprised at the remarks made by Mr. Douglas, and to hear him express a preference for D retorts, as modern experience generally had satisfactorily proved that they were much

weaker than the round or oval shapes. He could bear out Mr. Cathels in his observations with reference to Siemens's regenerative furnaces. He had tried it for gas-making, and as far as he had gone it was a failure; but this he attributed to the want of attention on the part of the men. The furnace itself was one of the most beautiful of inventions, but the necessity for changing the direction of the air every half hour presented a great difficulty to its use, as it was almost impossible to find men who would periodically attend to a matter of this kind without constant supervision. As to the material employed in the construction of retorts, he had tried them all, and in his opinion there were many situations in which iron retorts were still of great service. He had to do with many small works where in the summer season they were still found valuable; but in large works they were scarcely worth the room they occupied.

Mr. BROADHEAD said for the last eighteen years he had worked clay retorts entirely. They were D retorts, 7 feet 6 inches internal, 17 by 13, and he was satisfied if they produced 5000 feet per mouthpiece. The coal used was South Yorkshire (Silkstone), and with six-hour charges he obtained 8500 feet of gas per ton, of an illuminating power of 15 candles. The retorts were worked for two seasons—seven months one season, and twelve months the next—and when they were let down they were properly scurfed and pointed up ready for next season, so that he got two years regular working out of each retort. He had had nothing to do with brick ovens, and he had no exhauster. His heaviest gasholder gave a pressure of 4 inches all heats, and he worked with about 1½ inch extra pressure in the winter season. He admitted that he made a fair share of carbon; but this was not all loss, as he formerly obtained 15s., and now 20s. a ton for it. No doubt the question of retorts had to do with the question of dividends; and as the Grimsby Company, of which he was manager, had been able to pay 10 per cent. up to the present time, while giving satisfaction to the public in every way, he thought the preference he had given to clay retorts was justified.

Mr. CRAVEN (Dewsbury) said it was now ten years ago since he commenced to use iron retorts, and not being satisfied with the working of them, he tried clay and brick ovens, and ultimately entirely adopted clay. One cause why the brick retorts did not answer so well was that they were made too thick—5 inches instead of 3. He now obtained 4300 feet of gas per mouthpiece. He agreed with Mr. Douglas that clay retorts should not be kept in more than two seasons; and as a proof of this he might state that he had two which were going on for the third season, and he found his make of gas drop down from 22,000 feet in 12 hours to 14,000. He therefore pulled them out and replaced them by others, when his make again went up to 22,000.

Mr. DUNNING wished to add, with respect to the working of brick retorts, that he was in the habit of charging a double set—*i. e.*, six mouthpieces, two D retorts at each side of the fire, and one on each side above—with 15 cwt. of coal six times in 24 hours—*i. e.*, 4½ tons, all weighed in—and the produce on the average was between 40,000 and 42,000 feet of gas per 24 hours, or about 9200 feet per ton of coal carbonized. He could even do a little more than that, but he preferred to stop there, as he had to keep up the illuminating power to 15½ candles. This was done with 10 per cent. cannel of the district, and the rest Durham coal.

Mr. WOODALL said with reference to stage *versus* floor his personal experience was but a short one, but he believed that all those who had worked stage-work would be unanimous in saying that it was cheaper and better in every respect than floor-work, especially in large retort-houses, where it frequently happened that there was more than one gang of men at work at the same time, and where the running out of the barrows must be a considerable hindrance and annoyance. There was also the advantage attending it of keeping the men within the walls of the retort-house, and the great saving of labour in not having to remove the coke. He disagreed with Mr. Cathels as to the duration of retorts, and believed that with ordinary attention a clay retort might be made to last for 700 or 750 days without any loss of gas.

Mr. MORTON said the London Gas Company, to which he belonged, had been referred to by a previous speaker. He was happy to say that the shares of that company were in a far different state now to what they were at the period alluded to. The reason of their little value at that time was not the use of brick retorts, but of large ovens, for the manufacture of gas and coke together. With regard to stage-work and ground-work, he made a calculation some time ago, at the request of a member of the association, of the difference in the cost of the two systems—he had both stage and floor work in his establishment—and he found it to be 3½d. per ton of coals in favour of stage-work.

Mr. JABEZ CHURCH agreed with Mr. Cathels in the importance of the subject dealt with in his paper. There was no doubt that dividend or no dividend, so far as the manufacture of gas was concerned, must come from the retort-house, and therefore the proper setting of retorts was a most essential element. As far as his experience went he found that clay retorts could be worked successfully for about two years, and he believed it was a mistake to work them for a longer time. They might by patching and close attention be made to last longer, but the leakage more than counterbalanced the saving effected in deferring the cost of resetting. The cost of setting a clay retort was not a large item, and in the long run it would be found to be more economical to pull out old retorts after they had been in use for the period mentioned. He had had some experience with brick ovens, and he was convinced that ovens of the character of those formerly used at the London works were altogether a mistake. The object there was more a matter of coke-making than gas manufacture. It was sought to make coke which would be suitable for locomotive engines and foundry purposes, and such coke was double the value of gas coke. His father devoted many years to the manufacture of coke, and he knew from observation that ovens as set at the London works were a failure. He had seen those in use at Mr. Livesey's works, and could testify that, set on that principle, they were a perfect success. With reference to clay-retorts, it was idle to attempt to work a large number without an exhauster. The cost of clay retorts was about half that of iron; the cost had not varied much since their first introduction. Twelve years ago he had the honour to read a paper before the Institute of Civil Engineers, on the comparative value of clay and iron retorts, and he thought that was about the estimate he then gave.

Mr. CATHELS said there had been many beliefs expressed by the various speakers, but he should like to have heard their opinion backed up in some way by statistics. Mr. Douglas omitted to tell the meeting why he abandoned round and oval, and adopted D retorts. He did not think Mr. Douglas would get a D retort to do anything like what he had stated in his paper. With reference to Mr. Anderson's remarks, he could only say that he never had an arch drop. Such an accident could only result from bad workmanship, and not rubbing the bricks well together. Some of the speakers had spoken of the quantity of gas obtained per ton, but they did not say what kind of coal they used. They might, perhaps, be using coal which would give off the same quantity of gas in four hours as could be obtained from Newcastle slack in six hours.

Mr. JOHN SOMERVILLE read the following paper:—

ON TWELVE MONTHS EXPERIENCE WITH BEST AND HOLDEN'S RETORT DRAWING AND CHARGING MACHINES AT DUBLIN.

It is proposed in this paper to give the meeting, as briefly as possible, an account of the results of twelve months working of the "steam stoker," as the machine is technically termed; and, as a paper on the same subject was read at the last meeting of the association, describing these machines, and giving some account of their working, by Mr. G. Anderson, I will begin where he left off, expressing some doubts as to the commercial advantages to be derived from the use of these machines, and I trust that that gentleman, if he is present, will be better satisfied on that important point by the time I get to the end of this paper.

It is unfortunate, in more respects than one, that Dublin is divided from England by 65 miles of water, as it is a considerable barrier to the free intercourse which otherwise exists between insular cities and towns; and those who would wish to witness the action of the machines, so as the more accurately to judge of their performance, are debarred, unless at considerable sacrifice of time and convenience. To obviate this in a small degree, I have had made, and brought over with me, a working model, that you may see more clearly than by any description I can give, their working and action.

This model is a little different to what the machines really are. The action of some of the parts is changed. The principle remains the same, and, as you see, consists of a strong framework running on four wheels on rails laid upon the stage of the retort-house. This framework carries an unpright boiler with engine attached, which acts upon and drives two pitch chains, to which are geared the three rakes and three scoops; above the scoops, and supported by columns, is the hopper carrying the coals, and a small water-tank. It also moves along the rails, adjusting itself to any position opposite the retorts, and the manner of working it is as follows:—

One machine on either side of the range of benches (the same as two gangs of stokers) takes its supply of coals—about three tons—into the hopper, and a supply of ater into a tank for feeding the boilers and cooling the rakes. Three doors, or nine retorts, are opened, the machine advances in front of them, sends in the three rakes, draws out the coke, which falls to the stoke-hole into waggons placed to receive it below, and is there cooled in the usual manner; the machine is then moved on to the other open retorts, draws out the coke, and then returns to the retorts it first discharged; then the scoops, ready filled from the hopper, are sent in, turned half round, and withdrawn inverted; then the machine proceeds to the next, and in like manner to the others, and charges them, two men trimming the coals into the measures in the hopper, and one man guiding, by means of a shoot, the coals from the hopper to the scoops. The man who attends the rakes, in drawing the coke out, now closes the door as the machine moves away, and follows it to the next bench. This goes on till the whole section is finished, when the machine stops, takes in three tons more coals from the upper hopper and water for the boiler and rakes, and proceeds through the other sections until the whole of the retorts for that hour are both drawn and charged; then the machine returns to its standing-place and gets a little cleaning up, while the men sweep up the stage and rest for 20 minutes, until the next hour strikes, when the same operation is repeated, and so on from hour to hour.

A system of signals, given by a steam-whistle attached to each machine, regulates their action in drawing and charging; so that as soon as the rakes of one machine have taken hold of the charge of coke it signals to the other, which in its turn enters and takes hold of the coke, as the centre of the retorts is clear for the rakes to go down. The same is the case when the scoops of the No. 1 machine are turned over, the signal is given, and the scoops of No. 2 enter and discharge the coal. By this means collision between the rakes and scoops is avoided, and it leads to no delay, as the No. 2 machine keeps a little behind the No. 1.

This work has been done at the rate of 72 retorts per hour, the usual rate being 60 per hour, or one retort per minute. The greatest number of mouthpieces that have been worked this last winter with the machines was 20 benches, of nine retorts each, or 360 mouthpieces. These were charged 60 every hour, and were usually done in from 25 to 30 minutes; the quantity of coal put in each charge being 3 cwt. per mouthpiece, more or less, according to the state of the heats, the men filling the measures regulating the quantity. The average, however, is 12 cwt. per mouthpiece for 24 hours; so that the quantity put into the retorts by two machines in 24 hours was 216 tons, or 1512 tons a week. One week in January, 1708 tons were put in, but it was exceptional, the former figures being the average of the whole work while the number of retorts were in action.

The cost of doing this work consisted of—

4 engine-drivers, at 26s.	£5	4	0
4 rakesmen, at 25s.	5	0	0
4 chainmen, at 22s.	4	8	0
8 hoppermen, at 21s.	8	8	0
A total per week of	£23	0	0

which gives 3·65d. per ton of coals carbonized. During the week in which the greatest quantity of coal was carbonized the wages were 3·23d. per ton.

Next winter I hope to have the whole of the house, containing 516 mouthpieces, in action, and expect to carbonize 2200 tons per week, at a cost of 2½d. per ton.

The coke is removed from the stoke-hole in waggons, at present by manual labour, and the usual number of men are required to attend to the furnaces, ash-pans, &c.

The arrangement with the patentees who undertook the working is that they provide the four machines at their own cost, and keep them in repair and proper action, and do the work of drawing and charging for 3d. per ton of coals put into the retorts, but should the wages exceed this amount, one-half of it is to be borne by the company; thus, if the actual wages per ton amounted to 3½d., the company pay ½d. per ton more than 3d., and another agreement is that the company pay a royalty of 6d. per ton for licence to use the machines; thus the 6d. has to be added to the 3·65d., making 9·65d., then ·325d. has to be deducted for half excess of 3d. per ton, so that the patentees charge a total to the gas company for work done in carbonizing, repairs, maintenance, fuel, oil, wear and tear, interest, royalty, &c., 9·325d. per ton of coals carbonized.

It will be seen, therefore, that a considerable saving is effected by these machines, and there are also other advantages attending their use when compared with hand labour—such as the regularity with which the work is done, the absence of carbon in the retorts, the rakes being so shaped as to scrape the sides of the retorts, thus keeping the accumulation down, and enabling them to take the full quantity of coals throughout the whole winter without once requiring to be let down for a day or two, as is usual, and the consequent heavy wear and tear is avoided.

In connexion with the machine system it was found necessary that the coaling should also be done by machinery, as great difficulty and expense were experienced at their introduction in coaling by manual labour, which cost 8d. per ton; so last year a new arrangement has been carried out for coaling the machines, which is shown in section here.

There is a steam lift or hoist on either side of the retort-house, lifting 30 cwt. of coal in a waggon, which is run in upon a 3-ft. gauge railway, and turned on turn-tables, then run along a line of rails carried the length of the retort-house on brackets secured to the walls. This railway is above the hopper or stores of coals, from which the hopperman receives his supply by opening a door by means of a rack and pinion at the finish of each section as he moves with the machine.

On the line of rails two men on either side keep these hoppers always full, receiving the full waggons from the lift and returning the empty ones. These lifts are in direct communication with our coal-stores, the grinding-mill, where Mackenzie's patent compound, the mixing of oil and coal, is carried on, and also in connexion with our two lines of railway from the quay and the docks; so that the coals come direct from the steamer up the lifts, fall into the upper hoppers, from there into the hoppers of the machines, from the hoppers into the scoops, so into the retorts, without being touched by hand; or, in other words, the coal is taken from the steamer, conveyed into the retorts, converted

into gas and coke, and in the space of six hours deposited on the ground, all by machinery.

In connexion with the system it is found to be absolutely necessary that there should be a quick method of closing the retorts. This is at present done by means of one door or lid, planed on the face, closing three retorts at once, the mouthpiece covering three retorts, and having one ascension-pipe, also with a planed surface, and the two being brought close together are supposed to be gas-tight. When they were taken from the planing lathe it is possible they might have been tight, but my last winter's experience proves that they are very far from being so now.

This has been indeed almost the only source of trouble in the whole system. The door being 7 ft. long and 2 ft. 3 in. wide, made of ¾-inch wrought iron, with a strong angle iron round the edge, expands and contracts unequally, and the heavy blows given to the wedges, in bringing the surfaces together, tend to warp and twist the door, so that we have determined upon abandoning them, retaining the chamber part, and intend fitting on each chamber three mouthpieces, with Morton's patent lid and Holman's patent fastener, which I trust will overcome the difficulty.

Another great difficulty was the constant stopping of the ascension-pipes, and even the hydraulic main. The heat from the mass of ironwork was so great, and the main so close set upon the top of the benches, that it might not inappropriately have been termed a still for distilling tar. Frequently the pitch had to be taken out by means of pinch-bars, and the pipes were nearly half their time being cleared out. This has been remedied by raising the main 5 feet above the benches, and by fixing a flame-plate or fender above the mouthpieces, at such an angle as to throw the flame issuing from the open retort several feet from the ascension-pipes. These experiments have proved so successful that we have not had one stopped pipe all the winter.

In passing, I would recommend all who are troubled with stopped pipes to adopt this remedy as a complete cure.

With respect to the machine itself, unquestionably it is a step in the right direction, and will eventually tend greatly to cheapen the production of gas, especially in large works where it can be worked to advantage. It is, in my opinion, not quite suited in its present form to a work having less than 300 mouthpieces in use during six months of the year; but for works employing that number and upwards, two of these machines will be found not only advantageous in many particulars, but decidedly economical.

It may be said they are only in their infancy, and not yet fully developed, but doubtless year by year experience will suggest new applications in their parts or simplicity in their construction, which may add more and more to their efficiency and completeness.

Several improvements have been made during the last year, and others will be applied this year. For instance, the scoops are now being made wider, to enable them to put more coals into the retorts, and also to prevent the coals from spilling over the edges when being let down from the hopper. A self-acting arrangement (as shown here), instead of the bottom falling out, will convey the coals from the hopper to the scoops. By this means two men on each machine will be dispensed with, and a self-acting disc at the end of the scoop is added, so that when the scoop is turned over in the retort the disc flies open, and assumes the shape of the scoop, and does not draw the coals out of the retort like the fixed disc. A spring is also substituted for the weight in turning the scoops over. This will reduce the weight of the machines considerably. These and other improvements will doubtless be added as they suggest themselves.

The machine, as a whole, is a great triumph of engineering contrivance, and exhibits in a striking manner what may be accomplished in the way of substituting machinery for manual labour—in this case labour of a nature calculated to shorten human life. Let us not, therefore, regard these machines as mere innovations: let us rather welcome them as harbingers of the "good time" when gas-making shall become not only an interesting operation, but altogether one of pleasantness, and even one of salubrity.

Mr. Woodall confessed that he did not see where the great saving by this machinery was effected. He thought the experience of most managers would be that an ordinary workman did three tons in the course of 24 hours, and, as he took it, that would come to about 10½d. or 11d. per ton. By this machinery the cost was 9·6d., which was but a very slight difference.

(To be continued.)

Purchase of Kilmarnock Water-Works by the Corporation.—The Police Commissioners of Kilmarnock lately offered the directors of the water company the sum of £27,000 odd for their works, so that they might be made corporation property. There is a pretty unanimous feeling, both among the directors and shareholders, that the offer should be accepted, and it is therefore likely that the purchase will be consummated at an early date.

Dr. Whitmore's Report on the Quality of the Gas supplied in St. Marylebone, in May, 1870:—

May, 1870.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quantity of Sulphur in 100 Cub. Ft.	Mean Quantity of Ammonia in 100 Cub. Ft.	Sulphuretted Hydrogen.
	*Mean of 20 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Imperial Company's gas	16·54	18·15	15·09	25·02	10·42	25·62	1·66	None.
Chartered Company's common gas	16·07	17·06	15·49	37·97	18·12	29·30	1·26	None.
Chartered Company's cannel gas	22·60	23·45	22·00	30·04	14·65	29·03	0·82	None.

Mean of daily readings of Barometer . . . 29·85
" " " Thermometer . . 62·83

* Each observation consists of 10 readings of the photometer, at intervals of one minute.

During the month the gas of the Imperial Company gave a mean illuminating power equal to 16½ sperm candles, and ranged from 15 to rather more than 18 candles. Continuous testings for sulphur and ammonia showed a mean quantity of 25½ grains of the former impurity, and rather more than 1½ grain of the latter, in every 100 cubic feet of gas. The mean illuminating power of the Chartered Company's common gas was equal to 16 candles, and ranged from 15½ to 17 candles. Every 100 cubic feet of it contained a mean quantity of rather more than 29 grains of sulphur, and 1¼ grain of ammonia. The cannel gas of the same company gave a mean light equal to 22½ sperm candles, and ranged from 22 to 23½ candles. In every 100 cubic feet of this gas was found 29 grains of sulphur, and less than 1 grain of ammonia. On no occasion was sulphuretted hydrogen detected in either of the three gases, whilst with regard to those impurities which are still present, it is satisfactory to find that within the last few months they have decreased, and ammonia very much so. The pressure of all the gases was uniformly steady. The above results were obtained from the gas manufactured by the Imperial Company at their Fulham works, and from the Chartered Company's gas manufactured at their works, Horseferry Road, Westminster.

Dr. Whitmore's Report on the Quality of the Water supplied in St. Marylebone, in May, 1870:—

May, 1870.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by Incineration of Solid Matter in previous column.		Ammonia.
	May, 1869. 0°	May, 1870. 0°	May, 1869. 0°	May, 1870. 0°	0°
Distilled Water . . .					
West Middlesex water	17·20	16·00	·64	·64	—
Grand Junction water	17·36	17·10	·64	·76	—
Well in Bryanston Square	..	92·88	..	5·76	Nitric Acid.
Well in Gloucester Place	..	55·84	..	6·88	

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

The water supplied to the parish from the river Thames by the West Middlesex and Grand Junction Water Companies has been unusually bright and pure during the past month. As regards the amount of its organic contamination, it is in this respect but little inferior to the much vaunted waters of Loch Katrine, and many other northern lakes, whilst as a potable water it is infinitely more pleasant and agreeable. In the above table I have given analyses of two samples taken from surface wells in the parish, which water, it will be remembered, constituted not many years ago the ordinary drinking water of a large proportion of the inhabitants. To drink this water now would be to imbibe a slow poison, inasmuch as it is largely impregnated with sewage matter.

Dr. Frankland's Analysis of the Metropolitan Waters in May, 1870.—"Royal College of Chemistry, May 28, 1870.—Sir, I have the honour to submit to you in the following table the results of the chemical examination of the waters supplied to the metropolis during the month of May. For the purpose of comparison, I append also the results yielded by the water supplied to Manchester, and by Thames water taken at London Bridge at low water on the 8th of December last, and at Battersea Bridge at low and high water on the 1st of March. By permission of the Mayor and Corporation of Birmingham, I have also included in the table the results of the analysis of the water supplied to Birmingham. For some time past monthly analyses have been made for the mayor and corporation by Alfred Hill, Esq., M.D., F.C.S., the Birmingham borough analyst, and in future these results will, with your consent, be included in my monthly report. The water delivered by the companies drawing from the Thames has now attained its summer degree of purity, and scarcely contains more than one-third of the amount of organic matter which was present in it in January. I have filtered the domestic supply of my house (the West Middlesex Company's water) through animal charcoal, and a comparison of the analytical results yielded by the filtered and unfiltered water, and given in the annexed table, shows that the organic matter is reduced to about one-fourth by the action of the animal charcoal; indeed, the water so filtered actually contained less organic matter than the justly celebrated water supply of Manchester brought from the Derbyshire hills. Owing to long storeage in reservoirs, the East London Company's water has lost much of the evidence of previous sewage or animal contamination which attaches to it when it is taken from the Lea. The water supplied by the East London Company contained some brown suspended particles, amongst which living organisms were observed. The rest of the metropolitan waters were perfectly clear and transparent. Dr. Alfred Hill reports that the water supplied to Birmingham was pretty clear, but contained many large suspended particles.

Companies.	Date and Place of Collection.	Temperature in Centigrade Degrees.	Total Solid Impurity.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Previous Sewage or Animal Contam. (Estimated).	Chlorine.	Total Hardness.
Thames.											
Chelsea.....	May 17—Cab Rk., Horse Guards.	13·2	23·96	·115	·020	·000	·186	·206	1540	1·73	19·36
West Middlesex.	May 15—										
	14, Lancaster Gte.	..	24·60	·129	·023	·000	·188	·211	1560	1·60	19·36
	Thro' animal char.	..	19·40	·029	·007	·013	·194	·212	1730	1·60	15·24
Southwark & Vauxhall..	May 17—Cab Rk., St. George's Ch.	14·7	23·40	·117	·014	·000	·183	·197	1510	1·62	19·10
Grand Junction.....	May 17—Cab Rk., Woodstock St..	12·8	24·70	·135	·020	·000	·184	·204	1520	1·62	19·36
Lambeth....	May 17—Cab Rk., Lambeth Road.	13·6	24·50	·137	·018	·000	·185	·203	1530	1·60	19·36
Other Sources											
New River...	May 17—Cab Rk., Totnhm. Ct. Rd.	12·8	22·74	·063	·017	·000	·189	·206	1570	1·52	19·62
East London.	May 16—Slater's, Old Ford Road.	13·4	23·54	·135	·027	·000	·097	·124	650	1·70	18·84
Kent.....	May 16—Deptford Bdge. Police Sta.	13·3	39·76	·069	·018	·000	·394	·412	3620	3·35	28·32
Thames water, filtered..	December 8, 1869—Lond. Br., midstr., at low wat.	..	34·3	·558	·085	·103	·351	·521	4040	2·60	25·25
	Mar. 1, 1870—Battersea Br., midstr., at low wat.	..	30·64	·451	·060	·024	·493	·573	4810	1·75	25·85
	At high water	..	32·20	·476	·048	·075	·364	·469	3940	2·05	25·02
Birmingham.	May 10, 1870—Bir. Wr. Sup.	..	22·02	·214	·033	·004	·289	·325	2603	1·41	14·07
Manchester..	Jan. 29, 1870—Man. Wr. Sup.	..	5·74	·070	·007	·001	·000	·008	0	·80	2·48

"The Registrar-General, &c." "E. Frankland.

Register of New Patents.

1925.—Robert Nokes Williams, of 84, Hackney Road, in the co. of Middlesex, mahogany and veneer merchant, for "*Improvements in the manufacture of reflectors for artificial light.*" Provisional protection only obtained. Dated June 24, 1869.

These improvements consist in partially or entirely surrounding the burner or burners with a framework of metal or other suitable material, upon which framework is affixed by any well-known means, or let into recesses formed for that purpose, a series of reflecting plates, by preference made of silvered plate glass, although other substances may be employed for the purpose.

1931.—Alfred Henry Still and Denny Lane, both of the city of Cork, for "*Improvements in the manufacture of gas.*" Patent dated June 24, 1869.

This invention has for its object improvements in the manufacture of gas. In a pug mill or otherwise coal tar is mixed with small coal, or with a mixture of small coal and breeze. The whole mixture is then passed under heavy edge runners or through crushing rollers until all the ingredients are thoroughly incorporated and ground together. This mixture so ground is placed either by itself or mixed with ordinary coal in the retorts, to be carbonized, and two advantages are gained—first, the illuminating power of the gas is considerably increased; and, secondly, the breeze or small coke, which is a comparatively worthless material, is converted into good large coke, the particles being cemented together by the pitch of the coal tar which remains in the retorts. About 30 gallons of tar are employed to every ton of coal and breeze mixed therewith, and the proportion of mixed material added to ordinary coal depends upon the extent to which it is desirable to increase the illuminating power of the gas. If it is desired to increase the yield of coke, the proportion of breeze introduced into the mixture can be increased, the maximum amount being that which can be well cemented together by the bituminous matter of the coal and tar combined.

1973.—Robert Heyworth, of the city of Manchester, in the co. of Lancaster, plumber, for "*Improvements in water-closets, wash-basins, and urinals, and in self-acting apparatus for the same.*" Patent dated June 30, 1869.

These improvements consist in the use and application of an enclosed reservoir, of any suitable shape, placed alongside the closet-pan or wash-basin, below the level of the seat of the closet or top of the washstand, communicating with a passage or channel formed completely or partially round the upper rim or edge of the closet or basin, such reservoir being provided with a piston or plunger, which may be raised by means of a handle in the same manner as the ordinary closet handle, and thus cause the whole contents of the reservoir to pass into the closet or basin altogether and instantaneously, and thus to completely flush the closet or supply the basin with the necessary quantity of water.

1979.—Richard Wainwright Whitehead, of Ashton-on-Mersey, in the co. of Chester, for "*Improvements in coupling or jointing pipes or tubes.*" Provisional protection only obtained. Dated July 1, 1869.

In carrying out this invention the ends of the pipes or tubes to be connected are made as follows:—One end is provided with a deep taper annular recess, and with a shoulder at each edge thereof, and the other end is made with a taper projection, and shoulders corresponding in shape to the taper recess and shoulders on the other end.

1996.—Sam Smithson, of Heckmondwike, in the co. of York, dyer, and George Senior and John Inman of Brighouse, in the same co., brass finishers, for "*Improvements in valves or valve-taps for regulating the discharge or flow of water or other fluids or gases.*" Patent dated July 2, 1869.

This invention relates to valves or valve-taps for regulating the discharge or flow of fluids or gases, and consists in constructing either the valve or its seating of cork, lead, or a composition of lead and antimony, and by preference such valves or seatings are formed in circular and angular corrugations or rings, and capable of moving to or from each other without turning on their axes; also the spindles are formed to fit conical glands or boxes, so as to avoid packing.

The inventors claim—first, the application and use of cork, lead, or a composition of lead and antimony for either the valve or the seating of such taps; secondly, the method of making one face, whether valve or seating, corrugated or in angular rings so as to impinge upon the cork, lead, or composition of the other face; thirdly, making the spindles of such valves conical to fit in a gland or box, and thereby to avoid packing; fourthly, the construction, combination, and arrangement of valve-taps in manner substantially as described.

2006.—Henry Edward Newton, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*Improvements in meters for measuring liquids.*" A communication. Provisional protection only obtained. Dated July 2, 1869.

This invention consists in the combination with each other of a conical and needle valve, and their adaptation to the ingress and egress pipes of a meter for measuring liquids. To this end the liquid enters the body of the meter through an ingress-pipe that projects into the body of the meter. This pipe should be larger than the egress-pipe, so that the body of the meter may be kept full of liquid and under pressure. The inner end of the ingress-pipe has a cone-valve placed in it, the stem of which passes through a skeleton partition or frame placed in the ingress-pipe, and through a hole in an arm attached to the upper end of the pipe or to some other suitable support, so that the valve may always move up and down in a vertical line.

2016.—John Hart, of Leamington, in the co. of Warwick, for "*Improvements in the means of and apparatus for separatiag, distributing, and utilizing sewage.*" Patent dated July 3, 1869.

The apparatus is to be constructed at such an elevation and in such a situation as to ensure the distribution of sewage by the power of gravity, and to avoid deleterious results to health. For these reasons the sewage matter is to flow by gravitation, or be forced from the town by means of pumps to the separating apparatus, which consists of a series of concentric rings of brick or stonework, or other material, combined or not with iron, the central ring being elevated or not above the others, and so on throughout the series to the innermost ring, the supply-pipe entering beneath the inner or central ring or reservoir, which, when filled, allows the liquid to flow over into the concentric reservoir, and thus consecutively to the outermost ring, beyond which the liquid escapes in a thin sheet on to the surrounding land.

2021.—William Duckworth the younger, of Liverpool, in the co. of Lancaster, architect, for "*Improvements in taps for general purposes.*" Provisional protection only obtained." Dated July 5, 1869.

This invention consists in so fitting the lever or cross-head by which the faucet plug of the tap is turned in such a manner that the faucet always turns in one direction only on either opening or closing the tap, by which operation it has been found that taps so fitted last much longer, and are not liable to leak like those where the faucet has a reciprocating motion as now used.

2024.—William Robert Lake, of 8, Southampton Buildings, London, consulting engineer, for "*Improvements in water-meters.*" A communication. (Complete specification.) Patent dated July 5, 1869.

This invention consists, first, in enclosing within a case to which the water to be measured is admitted, a principal measuring cylinder and piston, and a secondary cylinder and piston of smaller size, which is combined with the main valve, and operates the same as hereinafter described; secondly, in attaching the working parts of the meter to a base-plate or channel-plate, in which are formed ducts or passages for the introduction into the meter from the inlet-pipe of the water to be measured for its distribution to the measuring cylinder, and for its delivery to the outlet, and in combining with the channel-plate a box-like cover, which contains the working parts, but is detachable therefrom, and may be removed without displacing them, and without disturbing the inlet or outlet pipe.

2032.—William Walker, of Dundee, in the kingdom of Scotland, N.B., for "*Improvements in motive-power engines, rotary pumps, and fans.*" Provisional protection only obtained. Dated July 6, 1869.

In carrying out this invention two conical or bevel wheels (toothed) are mounted so as to gear with one another, their axes revolving in suitable bearings, and forming an obtuse angle with one another. Thus at one part of their periphery the faces of these wheels are near together, and their teeth gear with our another, while at other parts of their periphery there is a distance or clear space between the teeth of the one and the teeth of the other. Through this clear space an induction-pipe conveys the working fluid to a point a little on the one side or the other of that part of the wheels which are in close gear, and the fluid thus conveyed enters the space left between the top of the tooth of the one wheel and the bottom of the hollow into which the tooth gears in the other wheel, and tends to force the wheels apart. This force being applied at one side of the central gearing-line causes the wheels to rotate, so as to increase the spaces occupied by the fluid between the teeth.

2036.—Leonard Clayton, Lawrence Clayton, and James Smith, of Hunslet, near Leeds, in the co. of York, gas engineers and contractors, for "*Improvements in the construction of taps or valves.*" Patent dated July 6, 1869.

According to this invention the barrel in which the plug is placed is formed of six branches, two of which form the inlet and the outlet passages, the other four being for guiding the gas, when used in gas-works, into and out of the purifiers. The plug is composed of top and bottom discs, connected by thin division-plates; one side of each of the plates has other plates at right angles thereto, which fill the spaces between any two of the openings at which they may be placed, and form bearing surfaces for the plug to work upon, and to make the same gas-tight. The patentees propose to employ only one tap for every two purifiers, and any one, two, three, or all four purifiers of a set can be shut off for the purposes of cleaning or for repairs. The plug is composed of top and bottom discs or plates, as before mentioned, which are connected by vertical division plates to form, as it were, three passages when the plug is in the barrel, one of the passages being between the plates, so as to lead the gas direct through the body, while the other passages are formed between the outsides of the vertical plates and the inside wall of the barrel. The edges of one end of the vertical plates are of the same thickness as the body of the plates, or they may be a little thicker, to obtain a little more bearing surface, if desired; but the edges on the other ends have plates or pieces projecting from both faces. These pieces have a surface corresponding in size with the face of the barrel between every two openings or passages, and each of the pieces is somewhat larger than the openings themselves; so that, when the pieces lie across two of the openings, the openings are entirely shut off, and the gas is caused to flow through the barrel in another direction. By this arrangement the gas may be directed straight through the body of the barrel without passing into any vessel; or, should it be desirable to lead it through a vessel before it passes on through the continuation of the pipe, the plug is shifted partly round, so that its passage is diverted, whereby it is led into the vessel from one connexion, and then out of the vessel by another connexion, and away through the continuation of the main-pipe, so that, should the tap be fitted to such vessels as gas-purifiers, the gas can be led through the same by simply turning the plug in the proper direction and the given distance. The plug is fitted in a barrel having six ways or passages, and it is arranged mid-distance between two purifiers. The gas, after passing through both purifiers, can be allowed to flow to the gasometer to be stored, or to any other apparatus for after treatment, as found desirable. The stem or head of the plug passes up through a cover or top-plate, which is secured in place by pins to the flange on the barrel, so that the plug works in the same in a gas-tight manner. The lid or top plate is easily removeable by releasing the pins, when the plug can be taken out for repairs or examination. The taper of the plug is such that it does not become fixed in the barrel from disuse. In some cases a bar is fitted on the plug-head, with a depending pin to drop into holes provided for it in the cover, so that the plug can be retained in any position for any length of time, as circumstances may dictate. The head of the plug may be provided with a key, so that it can be moved by hand, which would be advisable for small-sized taps; but when large taps are employed a wheel may be placed upon the head, and put in gear with a pinion and a crank handle. Holes may be formed in the barrel or in the lid for oil to pass through to lubricate the plug.

The foregoing description refers more especially to fitting the taps to gas-purifiers, but they are equally applicable for water-mains, and they state they will be found of great service if fitted to large water-pipes, as the water can be directed into almost any direction, and in the case of passing the water through a succession of filtering beds or basins, all impurities may be washed from it before it is allowed to be used. Among the advantages in the employment of these taps when fitted to gas-purifiers, when such are used in pairs, is that either one of the purifiers can be shut off from each set, so that it can be cleaned or repaired without stopping the passage of the supply.

2052.—Alfred Vincent Newton, of 66, Chancery Lane, in the co. of Middlesex, mechanical draughtsman, for "*Improvements in the construction of chandeliers.*" A communication. Patent dated July 7, 1869.

These improvements consist in an arrangement with a large pyramidal reflector—having any preferred number of plain sides curved in the direction of their length, and provided with corrugated and silvered glass, coated and protected from heat, water, &c.—of an inverted small polygonal, conical reflector set concentrically with the larger reflector, and fitted similarly but externally with plain or curved sides and glass reflectors. These together constitute what is termed a double-cone reflector. Also in the combination with the same of two or more pendent rings of different diameters, provided with burners also having flanges or other means for the suspension of prisms or glass ornaments or reflectors.

2067.—John Henry Jones, of Field Terrace, New Wandsworth, engineer, for "*Improvements in lamps.*" Provisional protection only obtained. Dated July 9, 1869.

This invention has for its object improvements in lamps for illuminating public buildings, apartments, railway and other carriages, from the ceiling or roof, and consists in admitting air direct to the burner by a short tube, which is either fitted into or formed in one piece with the outer glass casing. The tube of the burner, which it is preferred should be of the ordinary Argand construction, fits into this short air-tube, and, in order to prevent the light from being tampered with, a perforated plate may be secured to the mouth of or fixed inside the air-tube. Sometimes a pipe is connected with the upper part of the lamp, and is passed between the ceiling and flooring-boards into the ordinary chimney-flue, in order to carry off the hot air and products of combustion.

APPLICATIONS FOR LETTERS PATENT.

1634.—Alfred Willmer Pocock, of Pimlico, in the co. of Middlesex, engineer, for "*Improvements in meters, pumps, or other engines for water or other liquid.*" June 6, 1870.

1640.—William Wilson, of the city of Manchester, ironmonger, for "*Improvements in and apparatus for manufacturing gas for illuminating and heating from coal oils.*" June 7, 1870.

1664.—James William Butler, of Stonebridge Park, Willesden, in the co. of Middlesex, civil engineer, William David Butler, of Princes Street, Hanover Square, in the co. of Middlesex, civil engineer, and James Dunbar, of Vicarage Road, Camberwell, in the co. of Surrey, civil engineer, for "*Improvements in machinery or apparatus for supplying coal, cannel, or other substances to gas-retorts or ovens, and for withdrawing the same after distillation.*" June 9, 1870.

1679.—Robert Thomas Yeadon Johnson, of Stockton-on-Tees, engineer, for "*Improvements in rotary engines and pumps.*" June 10, 1870.

1682.—Bristow Hunt, of 1, Serle Street, Lincoln's Inn, in the co. of Middlesex, gentleman, for "*An improved joint for water, gas, and steam pipes.*" A communication. June 11, 1870.

1706.—Bevan George Sloper, of Northfleet, in the co. of Kent, for "*Improvements in the treatment of sewage.*" June 14, 1870.
1707.—George Weir, of Glasgow, in the co. of Lanark, and James Weir, of Liverpool, in the co. of Lancaster, for "*Improvements in slide-valves.*" June 14, 1870.
1713.—Henry Law, of 15, Essex Street, Strand, in the co. of Middlesex, civil engineer, for "*Improvements in apparatus for the supply of water to water-closets, urinals, lavatories, buildings, and streets, some of which improvements are applicable to other purposes.*" June 15, 1870.
1729.—Henry Hermann Kromschroeder, of 90, Camden Street, Camden Town, gas engineer, and William Parmington Randall, of 9, Dorset Street, Vauxhall Bridge Road, gas-meter maker, for "*Improvements in gas-meters.*" June 16, 1870.

GRANTS OF PROVISIONAL PROTECTION.

1513.—Charles William Siemens, of 3, Great George Street, Westminster, in the co. of Middlesex, for "*Improvements in regenerative gas-furnaces, and apparatus connected therewith, for the manufacture of glass; also partly applicable to regenerative gas-furnaces generally.*" Partly communicated. May 25, 1870.
1524.—David Jones, of Clerkenwell, in the co. of Middlesex, for "*Improvements in the manufacture and treatment of coal gas for illuminating purposes.*" May 26, 1870.
1560.—William Cleland, of Linacre, near Liverpool, in the co. of Lancaster, manager of gas-works, for "*Improved means and apparatus for exhausting, forcing, and purifying gas for heating and illuminating purposes.*" May 28, 1870.
1565.—William Thomas Small, of 13a, William Street, Camden Road, Holloway, in the co. of Middlesex, gas-fitter and worker in metal, for "*Improvements in the method or methods of supply and exit of water and other fluids respectively to and from aquariums, tanks, cisterns, and other like vessels, and in the apparatus connected therewith.*" May 28, 1870.
1634.—Alfred Willmer Pocock, of Pimlico, in the co. of Middlesex, engineer, for "*Improvements in meters, pumps, or other engines for water or other liquid.*" June 6, 1870.
1640.—William Wilson, of the city of Manchester, ironmonger, for "*Improvements in and apparatus for manufacturing gas for illuminating and heating from coal oils.*" June 7, 1870.

NOTICES TO PROCEED.

228.—Cromwell Fleetwood Varley, of Beckenham, in the co. of Kent, and Theodore Anthony Rochussen, of Abchurch Lane, in the City of London, for "*Improvements in producing heat and light.*" Jan. 25, 1870.
285.—Albert Werkmeister, of Berlin, in the kingdom of Prussia, manufacturer, for "*An improved liquid-meter.*" Jan. 31, 1870.
315.—John Henry Johnson, of 47, Lincoln's Inn Fields, in the co. of Middlesex, gentleman, for "*Improvements in gas and other pressure regulators.*" A communication. Feb. 3, 1870.
340.—Heinrich Witthöft, of Copenhagen, in the kingdom of Denmark, for "*Improvements in gas-burners.*" Feb. 5, 1870.
411.—James Smart, of Stratford, in the co. of Essex, engineer, for "*Improvements in slide-valves.*" Feb. 11, 1870.
436.—John Weems and William Weems, of Johnstone, in the co. of Renfrew, N.B., engineers, for "*Improvements in the manufacture or production of metallic pipes and sheets, and in making joints therefor.*" Feb. 15, 1870.
450.—Isaac Mason, of Hill House, Farnsfield, near Southwell, in the co. of Nottingham, engineer, for "*Improvements in apparatus for measuring oil and other liquids.*" Feb. 16, 1870.
1486.—Alfred Long, of 22, Aylesbury Street, Walworth, in the co. of Surrey, for "*Improvements in means for regulating the flow or controlling the supply of water or other fluids.*" May 23, 1870.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1671.—Augustus Lea Bricknell, "*Improvements in rotary pumps.*" June 7, 1867.
1684.—James Warburton, "*Improvements in apparatus for registering and recording the quality of gas.*" June 7, 1867.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

1405.—William Clark, "*Improvements in the distillation and separation of hydrocarburets and their derivatives, and in apparatus for the same.*" June 5, 1863.

Advertisements.

FLETCHER, SPECK, & CO.,

CONTRACTING GAS ENGINEERS, IRON & BRASS FOUNDERS,

GLENGALL IRON-WORKS, MILLWALL, LONDON, E., and RATCLIFF FOUNDRY, COMMERCIAL ROAD EAST, LONDON, E.,

MANUFACTURERS OF

TELESCOPIC and **SINGLE GASHOLDERS, TANKS, PURIFIERS, CONDENSERS,** and every description of **GAS-MAKING APPARATUS. IRON MAIN-PIPES** supplied and laid. **RETORTS, MOUTHPIECES, RETORT-LIDS, VALVES,** and **FITTINGS.** Wrought and Cast Iron Hydraulic Mains. **LAMP-POSTS, COLUMNS, GIRDERS, BRIDGES,** &c.

CORRUGATED IRON ROOFS & BUILDINGS.

GENERAL GAS CASTINGS PROMPTLY EXECUTED.

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MANUFACTURER OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1 in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle and Middlesboro'.	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£ s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1 (g.m.b.)	3 17 6	3 0 6	2 16 0	3 10 0	3 15 0
1¼ and 2-inch Socket-pipes	7 0 0	5 15 0	5 10 0	6 0 0	7 0 0
3¼ and 3-inch ditto	6 10 0	5 5 0	5 0 0	5 15 0	6 10 0
4 and 5-inch ditto	6 0 0	4 15 0	4 10 0	5 5 0	6 0 0
6 inches and upwards ditto	5 15 0	4 5 0	4 0 0	5 0 0	5 15 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 5 0	5 0 0	5 10 0
Ditto, 2nd ditto, cold ditto	6 10 0	—	—	—	6 10 0
Tank-plates, ¼ thick and above	6 0 0	5 0 0	4 15 0	5 10 0	6 0 0

WROUGHT-IRON TUBING,

Subject to 60 per cent. Discount.

	2 in.	1¼ in.	1½ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 14 feet—per foot	1 8	1 1	0 10	0 7	0 5	0 4½
Ditto ditto, from 12 in. to 33½ in.—each	3 0	2 0	1 6	1 1	0 9	0 8
Long Screws, from 12 in. upwards	4 0	2 3	2 0	1 6	1 2	0 11
Bends and Springs	4 3	2 3	1 9	1 3	0 11	0 8
Square Elbows, equal or reducing; Round Elbows, 5 per cent. extra	3 9	2 3	1 9	1 3	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 9
Crosses, ditto, equal or reducing	4 9	3 3	3 0	2 3	1 9	1 6
Iron Cocks	20 9	13 0	10 6	7 3	5 0	3 8
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4½
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	13 0	12 0	—

GAS COALS.

Newcastle—Unscreened:—	Per Ton.
Haswells, Nettlesworth Primrose, and South Pelaw	6s. 6d.
Felling, Framwell Gate, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose	6 9
Burnhope, Craghead, Charlaw, Derwent, East Castle, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, Seaham, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton, and Wilton	7 0
Peareth, Ravensworth Pelaw, Waldridge, West Garesfield, and West Pelton	7 3
Brancepeth, Dean's Primrose, Londonderry Gas, New Pelton, Pelton, South Peareth, Stella, Urpeth, Washington Hutton, and West Leverson	7 6
Ramsay's Newcastle Cannel	15 0
Wigan Cannel (at Liverpool)	17 0
Welsh Cannel:—	
Coppa Cannel (on rails at Birkenhead), 13s. 6d.; ditto (on rails at Connah's Quay)	13 0

Scotch Cannel, f.o.b.:—	Per Ton.	*Scotch Cannel*, f.o.b.:—	Per Ton.
Boghead—at Bo'ness, 47s. 6d.; at Leith	48s. 2d	Arniston (at Leith)	21s. 0d
Muirkirk	27 0	Wemyss (at Wemyss)	20 0
Kirkness, best (at Burntisland)	22 6	Haywood and Co.'s Haywood (at Granton)	20 0
Capeldrae, 1st quality (at ditto)	22 6	Pirnie, or Methil	17 0
Ditto, 2nd ditto (at ditto)	17 6	Lothian's Cannel (at Leith)	24 6
Cowdenbeath (at ditto)	12 0	Grange ditto (at Bridgeness)	17 6
Lochgelly (at ditto)	12 0	Kinniel ditto (at Bo'ness)	17 6
Donnibristle—at Burntisland, 12s.; at Aberdour	12 6	Myles' ditto	23 6
Auchinheath Lesmahago (at Granton)	27 0	Lochore Parrot (at Burntisland)	22 6
Nitshill and Lesmahago Coal Company (at Granton)	26 6	Lanemark (at Glasgow)	16 0
		Elphinstone Tower (at Leith)	20 0

FREIGHTS.

Coastwise—Newcastle:—	Per Ton.	*Foreign:*—	Per Keel.
Chatham and Rochester	5s. 3d to 6s. 3d	Barcelona	£18 10s
Cork	9 6	Bordeaux	12 0
Dover, Folkestone, and Ramsgate	6 9	Boulogne and Calais	8 0
Dublin	10 0	Cadiz	12 0
Exeter Quay	9 6	Cronstadt	12 0
Ipswich	5 0	Copenhagen	8 10
London (from Leith)	8 6	Genoa	16 10
London (Pool)	5 9	Hamburg	8 10
Lowestoft and Yarmouth	4 6	Havre de Grace	10 0
Portsmouth & Southampton	6s. 6d. to 7 0	Leghorn	16 10
Plymouth	8 6	Lisbon	13 0
Shoreham	7 0	Rotterdam	8 0
Whitstable	6s. 9d. to 7 0	Stettin	9 15
Weymouth	8 0	Trieste	17 0
		Venice	18 10

SUNDRIES.

Best Newcastle Fire-bricks, per 1000	£2 10s. to £2 15s. 0d.
Cliff's Fire-bricks (at Wortley), per 1000	2 15 6
Ingham's ditto (at Wortley), per 1000	2 15 0
Farnley Iron Co.'s Fire-bricks (at Wortley), less discount	2 17 0
Fire-clay Retorts, per foot run	5s. 6d. to 0 7 6
Tarred Rope Yarn, per cwt.	1 0 0

CHEMICAL, MINERAL, AND METAL MARKETS.

[*From* J. Burgess Spence and Co.'s *Weekly Report.*]

Soda.—Crystals are firmer than last week, at £4 2s. 6d. to £4 5s. Cream Caustic as before, at £12 10s. for 60 per cent.; and White, at £13 to £13 10s. Bicarbonate £9 10s., and £15 for Refined. Saltcake, £3. Soda Ash in request, at 1 11-16d. to 1⅞d. per degree. Sulphate of Soda, £3.

Nitrate of Soda.—In dull request, at £15 to £15 5s.

Potash.—Muriates have had an average demand, at £8 10s. to £8 15s. for 80 per cent.

Saltpetre.—Very quiet, with few transactions, and prices are rather lower.

Alum.—In usual request, at £6 5s. for Loose Lump, and £7 in export barrels; Ground, at £7.

Ammonia.—Brown Sulphate firmer, at £13 to £13 10s. White and Grey, better than last week, at £15 to £16 5s.

Copperas.—Dry in good demand, at 52s. Green and Rusty more inquired for.

Arsenic.—At £6 15s. to £7 5s. for Fine Powdered.

Acid.—Oxalic rather easier, at 8d. Tartaric active, at 1s. 3d. to 1s. 3¼d. Sulphuric, at £3 15s. per ton.

Magnesia.—Epsom Salts at £4 10s. to £4 12s. 6d. for Refined.

Oils.—Mineral Refined at 1s. 1½d. to 1s. 3d. Olive at £48 to £52. Pure White Norwegian Cod Liver Oil, at £9 10s. per barrel of 25 gallons.

Pitch.—Is comparatively better than for some time back, and 17s. per ton is now offered for abroad.

Guano.—Best Peruvian, £13 7s. 6d. to £13 10s.

Disinfectants.—Patent, at £5 per ton, for domestic and sewage purposes.

Pyrites in ordinary requirement, and prices are unchanged.

Lime.—Bleaching Powder in moderate request, at £8. Superphosphates meet with an average demand, at £4 to £4 5s. Mineral Phosphates, at 56s. for 65 per cent.

Manganese.—At 80s. for 70 per cent., and dull.

Iron Ore.—Hematite is active, at 13s.; for Oolitic there is a rapidly extending demand, and an advance is probable. Present prices, 6s. 6d. to 8s. 6d. in Staffordshire, and 2s. 9d. free on rails.

Iron.—Scotch Pig is rather quieter, at 60s. 3d. to 60s. 6d.; Cleveland selling freely, at 52s. for Forge 4, to 56s. 6d. for No. 1; Welsh Bars, £6 15s. to £7; Staffordshire Bars, £7 10s. to £8 10s.; Hoop Iron, £9; Gas Tubes, 60 per cent. to 67½ per cent. off list; Boiler Tubes, 40 per cent. to 42½ per cent.

Copper advanced. Smelters now ask £73 for English Tough Ingot; Chili Slab, £68 to £68 10s.

Tin is slightly weaker. English Ingot, £136 to £137; Straits, £133 to £133 10s.

Lead in fair demand. Best English Soft Pig, £18 10s.

Spelter very quiet. English, £19 5s. to £19 15s. Silesian, special brands, £19 5s. to £19 10s.

Share List of Metropolitan Gas Companies.

Number of Shares issued.	Amount per Share.	Name of Company.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£		£ s. d.	£ s. d.	£
8000	10	Anglo-Romano	10 0 0	10 0 0	11 — 12
5000	20	Bahia (Limited)	20 0 0	3 0 0	13 — 14
1000	20	Do., preference	20 0 0	10 0 0	22 — 23
750	20	Do., do., redeemable	20 0 0	10 0 0	20 — 22
40000	5	Bombay (Limited)	5 0 0	4 10 0	6¼ — 6½
10000	5	Do., third issue	4 0 0	4 10 0	4¾ — 5¼
10000	20	British (Limited) (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge, & Holywell.)	20 0 0	10 0 0	30½ — 31½
7500	20	Cagliari (Limited)	20 0 0	7 0 0	
12000	50	*Chartered*	50 0 0	8 0 0	68 — 69
6000	50	Do.	45 0 0	8 0 0	63 — 64
30000	10	Do., preference	2 0 0	5 0 0	3 — 3½
10000	20	*City of London*, A shares	20 0 0	9 0 0	24 — 26
10000	10	Do., B shares	10 0 0	4 0 0	6¾ — 7
9629	10	Do., new shares	10 0 0	9 0 0	12¼ — 13
17490	25	*Commercial*	25 0 0	10 0 0	41 — 42
20000	20	Continental Union	20 0 0	8 0 0	28 — 29
10000	10	Do., new	5 0 0	..	9 — 9½
5213	20	Do., preference	20 0 0	7 0 0	25 — 26
5000	10	*Crystal Palace District*	10 0 0	10 0 0	16 — 16½
5000	10	Do., preference	10 0 0	6 0 0	11 — 11½
10000	10	Do., new shares	10 0 0	7 0 0	12 — 12¾
4000	50	*Equitable*	50 0 0	10 0 0	82 — 84
4000	25	Do., new shares	25 0 0	10 0 0	41 — 42
23406	10	European (Limited)	10 0 0	11 0 0	18 — 18½
12000	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	11 0 0	10 — 10½
20000	10	*Great Central Gas Consumers*	10 0 0	..	18 — 19
5000	10	Hong Kong (Limited)	10 0 0	7 0 0	11 — 12
26000	50	*Imperial*	50 0 0	10 0 0	84 — 85
26000	10	Do., new shares	7 0 0	10 0 0	12¼ — 13
26000	12½	Do., new shares	12 10 0	7 0 0	15 — 15¼
1300	100	Do., bonds	£100	10 0 0	175 —180
23000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Cologne, Frankfort-on-Maine, Haarlem, Stolberg, Toulouse, & Vienna.)	43 15 0	18 5 0	135 —136
400	100	Imperial Mexican (Limited)	100 0 0	nil.	
200	100	Do., new	100 0 0	nil.	
3000	40	*Independent*	40 0 0	10 0 0	64 — 65
3000	10	Do.	10 0 0	5 0 0	7 — 9
3000	20	Do.	15 0 0	7 10 0	17 — 18
7133	50	*London*	50 0 0	10 0 0	82 — 84
5610	25	Do., 1st preference	25 0 0	6 0 0	28 — 30
503	50	Do., 2nd preference	50 0 0	6 0 0	
214	50	Do., 3rd preference	50 0 0	6 0 0	
£18781		Do., 1st preference stock		6 0 0	
£11828		Do., 2nd preference stock		5 0 0	
		Niethercy, Brazil (Limited)			
15000	5	Malta and Mediterranean (Limited)	5 0 0	4 10 0	3¾ — 4
6000	5	Do., preference	5 0 0	7 0 0	4¾ — 5¼
30000	5	Oriental (Calcutta)	5 0 0	10 0 0	8 — 8½
30000	5	Do., new shares	1 10 0	10 0 0	3 — 3¼
10000	5	Ottoman (Limited)	5 0 0	nil.	2 — 2¼
14000	10	Pará (Limited)	10 0 0	10 0 0	10 — 11
27000	20	*Phœnix*	20 0 0	10 0 0	33 — 34
3500	100	Do., new	40 0 0	7 10 0	45 — 47
144000	8k.	Do.	100 0 0	5 0 0	83 — 86
5000	20	*Ratcliff*	20 0 0	10 0 0	27 — 28
	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	28¼ — 29
6959	5	Singapore (Limited)	5 0 0	5 0 0	
2000	5	Do., preference	5 0 0	7 10 0	
1500	32½	Shanghai	32 10 0	12 0 0	
4000	50	*South Metropolitan*	50 0 0	10 0 0	82 — 85
4000	12½	Do.	12 10 0	10 0 0	20 — 22
20000	12½	Do., new shares	1 0 0	10 0 0	3 — 3½
15000	10	*Surrey Consumers*	10 0 0	10 0 0	16 — 16½
10000	10	Do., new	6 0 0	10 0 0	10 — 10½
9000	4	United General (Limerick)	4 0 0	5 0 0	2¼ — 2½
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	10 — 12
1500	10	Do.	10 0 0	7 10 0	
1819	10	Do.	10 0 0	7 10 0	
1138	10	Do.	5 0 0	7 10 0	
20000	10	Western (Limited) A shares	10 0 0	10 0 0	17 — 17¼
10000	10	Do., B shares	8 0 0	10 0 0	14¼ — 15
10000	10	Do., C shares	8 0 0	10 0 0	13 — 13½
20000	10	Do., D shares	1 0 0	10 0 0	2¼ — 3
16000	5	*West Ham*	5 0 0	7 10 0	7 — 7¼
551	10	West London Junction (Limited)	10 0 0	6 0 0	
520	10	Do., preference	10 0 0	6 0 0	

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LESMAHAGOW

CANNEL COAL.

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WANTED, by the Advertiser, a situation as Manager or Secretary and Manager in a Gas-Work. Has had many years experience in the erection and management of Gas-Works, and can produce testimonials and references as to character and ability.
Address A. Z., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an appointment as Chief CLERK or ASSISTANT MANAGER in any part of the world, by a young Man, 28 years of age, who speaks and writes English and French, and has had the keeping of accounts and the care of important Gas-Works in France during a seven years engagement as chief clerk in one of the English companies. Excellent references.
Address DAVID SNODGRASS, No. 11, Austin Friars, LONDON, E.C.

WANTED, a situation as Manager of Gas-Works, or FOREMAN of a work. Thoroughly understands the manufacture of gas, main-laying, meter inspecting, and fitting work generally. The make of gas at the works he now has the charge of is about 30,000,000 cubic feet per annum. Satisfactory reasons for leaving present situation.
Address H. J., Gas-Works, UXBRIDGE.

WANTED, by a young Man, aged 30, a situation as METER INSPECTOR &c. Is a thoroughly practical gas-fitter. Unexceptionable references.
Address H. H., 41, Frederick Street, Gray's Inn Road, LONDON, W.C.

WANTED, a situation as Manager to a Gas Company making from 10,000,000 to 20,000,000 annually, or as Foreman, Fitter, and Meter Inspector.
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TRAVELLER Wanted for the Gas-Meter Trade, to represent a highly respectable firm in London and southern counties. A liberal salary will be given to a person of good character and experience in the meter trade.
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TO GAS ENGINEERS, COMPANIES, OR PROPRIETORS.

A Good practical Gas-Fitter and Manager wants employment as Manager, Fitter, Inspector, or Book-keeper. Good testimonials, reference, and security.
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FOR SALE, at the Kidderminster Gas- Works, the following GAS APPARATUS:—
2 sets of Condensers, with 5-in. pipes; 2 Washers; 1 Exhauster and gearing; 1 Governor, with 9-in. connexion; 1 Gasholder, 40 ft. by 12 ft. deep, with malleable iron tank; 1 Gasholder, 30 ft. by 10 ft. deep; 3 Purifiers, 7 ft. by 3 ft. 6 in. and 3 ft. deep; 3 Purifiers, 12 ft. square and 4 ft. 6 in. deep (both sets of purifiers have rack-valves and lifting apparatus complete); 117 ft. of H-main, 18 in. by 22 in.; with 80 mouthpieces, lids, ascension and bridge pipes, &c., complete, and a lot of odd castings. To be sold because of recent extensions.
For further particulars, apply to
ANDREW DOUGALL, Manager.
Kidderminster Gas Office, June 10, 1870.

FOR SALE, Two Purifiers, 3 ft. 6 in. square by 2 ft. 9 in. deep, with Clayton's six-way centre-valve.
Apply to CLAYTON, SON, AND CO., Gas Engineers and Contractors, Hunslet, LEEDS.

FOR SALE, Five Cast-Iron Guide Columns and Girders.
Five Grooved Wheels in sliding carriages. The columns are 26 ft. long, 12 in. diameter at the base, and 10 in. at the top.
The Wrought-Iron Framing for a 40-ft. Gasholder.
Centre-Valve for Four Purifiers, with 6-in. connexions.
Address MANAGER, Gas-Works, NEWBURY.

TO BE SOLD, on the Works of the Wolverhampton Gas Company, 136 ft. of Cast D Hydraulic Main, 18 in. by 18 in.
120 4-in. Bridge and Dip Pipes.
120 Stand-Pipes, tapering from 5 to 4 in.
80 15-in. Round Mouthpieces for clay retorts.
30 18 by 13 D Mouthpieces for ditto.
The whole or any part thereof at £4 per ton.
200 15-in. Wrought-Iron Lids for Retort Mouthpieces, at 12s. per cwt.
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TO BE SOLD, the following Gas Appara- TUS—viz., One set of Four Purifiers, 9 ft. by 6 ft., with 6-in. connexions and hydraulic centre-valve complete; Two Circular Scrubbers, one 3 ft. 3 in. by 9 ft., the other 5 ft. by 10 ft., with 8-in. connexions and centre-valve complete; One Station-Meter, to pass 8000 feet per hour; One 18-in. Governor, one 8-in. do.; One 4-horse high-pressure Steam-Engine; One of Jones's Exhausters, with 10-in. connexion, valves, and by-pass; One Exhauster Governor, by Braddock (nearly new); Three Iron Roofs, 26 ft. 6 in. span by 120 ft. long (total); 45 iron D Retort Mouthpieces, 12 in. by 15 in.; 30 do. do., 18 in. by 13 in.; 45 Ascension-Pipes, 5 in. to 4 in.; 30 Ascension-Pipes, 5 in.; 45 H Pipes, 4 in. to 3 in.; 30 H Pipes, 3 in.; 45 Dip-Pipes, 3 in.; 30 Dip-Pipes, 5 in.; 7 lengths of D-shaped Cast-Iron Hydraulic Main, 6 ft. each; 6 lengths do. do., 7 ft. 3 in. each; 2 lengths of Circular do., 6 ft. 3 in. each.
Further particulars may be obtained on application to Mr. W. WRIGHT, the Manager.
Gas-Works, Shipley, May 27, 1870.

ROBERT MACLAREN and CO., EGLINTON FOUNDRY, GLASGOW, Manufacturers of all sizes of Cast-Iron Main-Pipes by an improved Patent, General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

THE IMPERIAL CONTINENTAL GAS ASSOCIATION.
(INCORPORATED BY ACT OF PARLIAMENT.)
NOTICE is hereby given that the REGISTER of TRANSFERS of SHARES in this Association will be CLOSED for a period of Fourteen days from the First day of July next, preparatory to the allotment of New Shares and the issue of New Certificates.
By order of the Board of Direction,
ALBERT F. JACKSON, Secretary.
30, Clement's Lane, Lombard Street, London,
June 22, 1870.

BRITISH ASSOCIATION OF GAS MANAGERS.
PHOTOGRAPHIC GROUPS of Members and Friends of the above Society, taken at the Chartered Gas-Works, Beckton, June 9, 1870, may be had of the Photographer, F. R. WELLS, Heath Street, BARKING. One copy, 3s. 6d.; 6 copies, 20s.
Post-Office Orders payable to Francis Wells.

GAS TAR & AMMONIACAL LIQUOR FOR SALE.

THE Directors of the Dudley Gas Com- pany invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR to be produced at their works for One year, ending June 30, 1871. The quantity of tar will be about 60,000 gallons, and liquor 150,000 gallons.
Tenders to be sent not later than the 5th of July next.
The Directors do not bind themselves to accept the highest or any tender.
Gas-Works, Dudley, June 15, 1870.

COAL TAR & LIQUOR.

THE Directors of the Reading Gas Com- pany are prepared to receive OFFERS for TAR and AMMONIACAL LIQUOR for One, Two, or Three years. They have a low tank-barge, holding about 50 tons, into which they will deliver alongside their works.
Further particulars can be obtained of the undersigned, to whom tenders can be sent until the 4th of July.
ROBT. BRADLEY, Secretary.
22, Market Place, Reading, June 14, 1870.

TO GASHOLDER MAKERS.

THE Directors of the Watford Gas and Coke Company are desirous of receiving TENDERS for the erection at their works, at Bushey, near Watford, of a GASHOLDER, 60 ft. in diameter by 18 ft. high.
Plans and specification and form of tender may be seen at the Company's Works, at Bushey, on application to the Manager.
Sealed tenders to be sent to the Secretary, WILLIAM ROWELL, Solicitor, Rickmansworth, on or before the 28th of June, 1870.

TENDERS FOR GAS COAL.

THE Directors of the Ratcliff Gaslight and Coke Company are prepared to receive TENDERS for the supply of 18,000 tons of best GAS COAL, to be delivered subject to the usages of the Port of London, by vessels suitable to the berth alongside the Company's derrick, at Wapping, London, in as nearly as may be the following monthly quantities:—

July, 1870	1200 tons.
August, 1870	2000 ,,
September, 1870	2000 ,,
October, 1870	2000 ,,
November, 1870	2000 ,,
December, 1870	2000 ,,
January, 1871	1800 ,,
February, 1871	1200 ,,
March, 1871	1000 ,,
April, 1871	1000 ,,
May, 1871	1000 ,,
June, 1871	800 ,,

The Coal to be fresh wrought, dry, unscreened, as free as possible from pyrites, bats, bind, or other refuse, and to be weighed by the Company's meter in accordance with the custom of the London Coal Meters Office.
Tenders to be addressed to the SECRETARY, endorsed "Tender for Coal," and to be delivered on or before the 25th day of June, 1870, at the Company's Offices, 345, Cable Street, LONDON, E.

THRAPSTON GAS & COKE COMPANY, LIMITED.

THE Directors of the above Company are prepared to receive TENDERS (up to the 28th inst.) for the supply of about 300 tons of SILKSTON GAS NUTS COAL, delivered at the Midland Railway Station at Thrapston, from the 1st of July, 1870, to the 1st of July, 1871.
The directors do not bind themselves to accept the lowest or any other tender.
Thrapston, June 9, 1870. WILLIAM IBBS, Secretary.

CONTRACT FOR COAL.

THE Directors of the Hemel Hempstead Gas Company are prepared to receive TENDERS for the supply of about 900 tons of GAS COAL or SCREENED NUTS, between the 15th day of August, 1870, and the 15th day of August, 1871, in such quantities as they may from time to time require, to be delivered at the Railway Station, Box Moor.
Tenders, stating quality of Coal and colliery from which supplied, to be sent in on or before the 28th of June, endorsed "Tender for Coal," addressed SECRETARY, Gas Company, Hemel Hempstead, HERTS.

TO SCRAP IRON DEALERS & OTHERS.

THE Directors of the Independent Gas- light and Coke Company are prepared to receive TENDERS for a quantity of OLD PIPES and other CASTINGS on their works, at Haggerstone. The same may be seen, and all information can be obtained, on application to Mr. R. J. Laing, Engineer, on the works.
Tenders to be sent in to me, on or before Thursday, the 30th of June, endorsed "Tender for Old Iron."
By order,
JAMES B. COULSON, Secretary.
236, Kingsland Road, June 17, 1870.

TO TAR DISTILLERS.

THE Directors of the Independent Gas- light and Coke Company are prepared to receive TENDERS for the TAR produced at their works, at Haggerston, for One year, from the 31st of July, 1870.
Tenders to be sent to me, on or before Thursday, the 7th day of July, endorsed "Tender for Tar."
The Directors do not bind themselves to accept the highest or any tender.—By order,
JAMES B. COULSON, Secretary.
36, Kingsland Road, June 17, 1870.

SWINDON NEW GAS COMPANY, LIMITED.

THIS Company is prepared to receive TENDERS for:—
1. The Supplying and Setting of Two Benches of four retorts each, with hydraulic, &c., complete.
2. The Supplying and Fixing of Engine and Exhauster, with pumps, &c., complete.
Plans can be seen at the works, or had on application (price 5s.), and any information obtained of the Secretary.
Sealed tenders to be sent in not later than the 28th of June, inst.
The Company reserves the right to reject any or all tenders. By order,
New Swindon, Wilts. JOHN J. JERVIS, Secretary.

Now ready, in roan tuck, gilt edges, price 6s., postage 4d.,

WEALE'S ENGINEER'S, ARCHITECT'S, AND
CONTRACTOR'S POCKET-BOOK for 1870.
Containing a vast mass of useful Rules, Tables, Formulæ, &c., &c., with 8 copper plates, and numerous wood-cuts.
"A necessary and reliable book of reference. Every branch of engineering is treated of, and facts, figures, and data of every kind abound."—*Mechanics' Magazine.*
"It contains some valuable information to managers of gas-works, more especially a gas engineer's calendar, with tables for calculating the periods of lighting and extinguishing public lamps."—*Journal of Gas Lighting.*
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With Illuminated Cover and over 300 Engravings.
Price 1s.
This book is replete with information, and prices of many well-known as well as perfectly new inventions, interesting to all in the mechanical trades, as well as corporations, governments, gas managers, private gentlemen, and shopkeepers.
Post free in the United Kingdom, 1s.
JOHN BAILEY AND CO., Albion Works, Salford, LANCASHIRE.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.
HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, E.C., and 138, Regent Street, LONDON. Agents wanted.

T. EVANS & SONS, Retort-Setters and GAS-OVEN BUILDERS, having done the work at various Gas-Works in England and Wales for many years, can be well recommended. Testimonials and references on application.
Communications to be addressed to the Gas-Works, Cannock, near STAFFORD.

SWANWICK CANNEL.
The yield of this Cannel is liberal, the illuminating power large, and coke good.
For prices and terms, apply to
H. BOAM, 1, Darwin Terrace, DERBY.

OXIDE OF IRON.—
We are prepared to supply, on moderate terms,
HYDRATED PEROXIDE OF IRON (BOG OCHRE),
Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.
FRANCIS RITCHIE & SONS,
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FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
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DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

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WOOD SIEVES FOR PURIFIERS.
These justly celebrated Sieves, with bevel bars and hard-wood side frames, have been extensively made by Messrs. Walker for over seven years, and their advantages and durability are fully established. Messrs. Walker make them in very large quantities, having mills and machinery specially laid out for them, producing them at the most moderate cost.
MIDLAND IRON-WORKS,
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TWENTY YEARS PRACTICAL EXPERIENCE.

EDWIN BENTLEY,
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Fire-Clay and Iron Retorts, Double and Single Grooved Brick Retorts, of every description.
Bentley's Improved D Brick Segment Retorts, 5 or 3 in one bed.
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IMPROVED
WOOD SIEVES FOR GAS PURIFIERS.
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The above Sieves are used by the principal Gas Companies in London and the country. Their utility, durability, and cheapness combined, render them superior to all others.
Testimonials from Gas Engineers who have tested their qualities forwarded on application.
All orders punctually attended to, and estimates given if required.

JAMES M'KELVIE,
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Established 1840.

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WOLVERHAMPTON
MANUFACTURERS OF
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GAS-FITTINGS,
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MEDIÆVAL FITTINGS FOR CHURCHES, &c.
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TO GAS & WATER METER MANUFACTURERS, MACHINISTS, & OTHERS.
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THE MERSEY WORKS,
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Manufacturers of all descriptions of Gas, Water, and Station Meter, Clock, Timepiece, Tell-Tale, and Log Dials, Lettered Addresses, Number Plates, Gauges, Scales, &c.
Superior Articles at reasonable prices.

W. J. SIMMONDS,
Retort and Boiler Setter and Contractor for Gas-Works in general,
7B, SOUTH STREET, NEW NORTH ROAD,
ISLINGTON, LONDON, N.
Upwards of 16 years Retort Setter to the Chartered Gas Company, Brick Lane and Curtain Road Stations.
Materials supplied on reasonable terms if required, or labour only.
No connexion with any other Retort Setter.
N.B.—Orders to be addressed as above.

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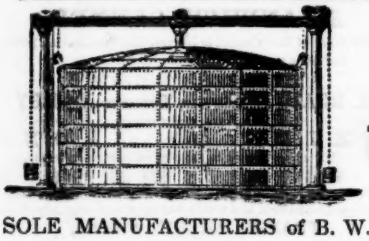
IMPROVED WET & DRY CONSUMERS GAS-METERS,
GAS STATION-METERS,
With all the Joints planed,
GOVERNORS, GAUGES, INDICATORS, EXHAUST GOVERNORS, &c.
TERMS, &c., ON APPLICATION.



IMPROVED GAS APPARATUS,
FOR CITIES, TOWNS, VILLAGES, &c.,
INVENTED AND MANUFACTURED BY
W. C. HOLMES & CO.,
WHITESTONE IRON-WORKS, HUDDERSFIELD.
SOLE MANUFACTURERS of B. W. THURSTON'S IMPROVED SCRUBBER, CONDENSER, and WASHER, in use in many of the principal Gas-Works on the Continent.
PATENTEES of the IMPROVED COMBINED PURIFYING APPARATUS, so eminently adapted for Exportation.
ESTIMATES, PLANS, and SPECIFICATIONS PREPARED for BUILDINGS and APPARATUS.
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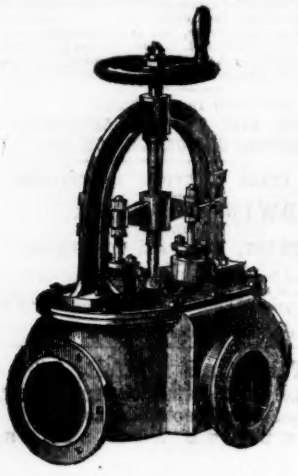
*** *Please address letters to Huddersfield.*
REFERENCES TO NEARLY 300 GAS-WORK

CATHELS & TERRACE'S
PATENT FOUR-WAY DISC GAS-VALVE

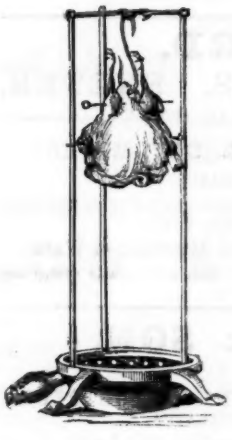


(Being a simplification and improvement of Cathels's well-known Valve) is the best Valve for Gas-Works. It is specially applicable as a by-pass to Condenser, Exhauster, Scrubber, Station-Meter, &c., as, having no springs, ground faces, or other delicate complications to be affected by crude gas, it NEVER SETS FAST. When applied to Purifiers, the utmost facility of change is afforded; the direction of the flow of the gas is seen at a glance, and no unpurified gas can pass into the holders at each change, as happens with Centre-Valves. In either application ONE VALVE SERVES AS THREE OTHER VALVES. The opening and closing are now effected by one movement, and the ports being all on the same level, enables the connexions to be simple lines of straight piping. The closing of one gas-way opens another, preventing the possibility of accidentally stopping back the gas. The Valve has been in general use for upwards of five years, with the most satisfactory results, and is so simple and strong that it may be considered indestructible.

Illustrated Circular, Prices, &c., on application to the Makers,
Messrs. GUEST & CHRIMES,
FOUNDRY AND GENERAL BRASS-WORKS,
ROTHERHAM.

S. LEONI, ADAMAS WORKS, ST. PAUL STREET, NEW NORTH ROAD, LONDON, N.

One joint, one dish of potatoes roasted, and two pies baked in one hour, at the expense of one pennyworth of gas.



A joint of 6 lbs. roasted in 1 hour—consumption of gas 20 feet—cost one penny (at 4s. per 1000); 10 lbs., 1½ hour; 15 lbs., 2 hours.

Four quartern loaves of bread baked in one hour.

£5 5s. complete, without flue.

FIRST-CLASS PRIZE MEDALS OF INTERNATIONAL EXHIBITIONS OF 1862 & 1867, & CORNWALL ROYAL POLYTECHNIC INSTITUTION, 1869.

Economizer. Scale 1-10th of full size.

Economizer. Scale 1-10th of full size.

Portable Atmospheric Gas Heating Stove.

China, with Coloured Designs

S. Leoni's Catalogue

Leoni's Patent Standard Gas Burner.

One Shilling each. Triangles for Globes 6d. each.

LEONI'S PATENT ATMOSPHERIC GAS COOKING STOVES,

(Broiling and Roasting by Reflection only), from 15*s.* each.

LEONI'S PATENT ATMOSPHERIC GAS HEATING STOVES,

For Halls, Conservatories, Counting Houses, Rooms, Churches, &c. (most economical, no flue required), from £1 16*s.* each.

Leoni's Patent Atmospheric Open Gas Fires,

(Cheerful, brilliant, and most effective) with asbestos or clinkers), from £1 1*s.* each.

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With self-heating hot-water circulating boiler for green-houses and all buildings, (require no atttention, and are very economical).

LEONI'S PATENT ATMOSPHERIC GAS APPARATUS,

(No flue required) with copper circulating water boiler, and 5 ft. 6 in. bath, (36 gallons of water raised to a temperature of 100° F. in ½ hour with less than a pennyworth of Gas and without any smell), from £10 10*s.* complete.

LEONIS PATENT ATMOSPHERIC GAS ROASTING & ALSO BAKING APPARATUS.

(In 1 hour's time with less than 1 pennyworth of Gas 6 lbs. of meat are well roasted, or 16 lbs. of bread baked, also one joint roasted, one dish of potatoes roasted, and 2 pies baked, all together in one hour), from £5 5*s.* each complete.

Leoni's Patent Gas Baking, & also Roasting Ovens,

Portable for stationary, or families, restaurants, hotels, clubs, hospitals, and establishments of the largest kind.

Leoni's Patent Atmospheric GAS RANGES,

Complete. Portable or stationary, for families, hotels, &c.

IMPROVED PATENT ADAMAS GAS BURNERS,

(Approved and highly commended by the official Gas Referees, *Vide* "Report," obtained Prize Medals in 1862 and 1867), from 1*d.* each.

LEONI'S IMPROVED PATENT ADAMAS TAPS

For Beer, Wine, Acid, &c., never corrode or leak, turn always easy and smooth, and are constantly clean and sweet, from 1*s.* 3*d.* each.

Chops and steaks, or two fowls, or a joint roasted on gridiron, and, at the same time, soles, &c., fried on top of the reflector.

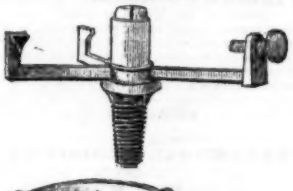
Gas consumers, once aware of the advantages of cooking by Gas, will be glad to meet with efficient apparatus, **and Gas Companies have every interest to make such apparatus known.**

AGENTS WANTED IN EVERY TOWN.

LIBERAL TERMS.

PATENT STANDARD BURNER.

Scale ½ size.



CANNEL COAL.—The West Yorkshire Iron and Coal Company, Limited, beg to draw the attention of Gas Companies to their Cannel, of which the following is the analysis made by W. Huggon, Esq., F.C.S.:

Yield of gas per ton . . . . 10,296 cubic feet.
Illuminating power rather over 21 sperm candles.
Yield of coke per ton . . . . 12 cwt.

The actual working, as reported by one of the largest gas companies in Yorkshire, gives results still more favourable, viz.—

Yield of gas . . . . . 10,416 cubic feet.
Illuminating power . . . . . 21·89 sperm candles.
Coke . . . . . The same.

We add from the same source the capabilities of the common gas coal—

Yield of gas . . . . . 10,080 cubic feet.
Illuminating power . . . . 14·41 sperm candles.
Yield of coke . . . . . 13 cwt.

COLLIERIES—WEST ARDSLEY, near LEEDS.

For further particulars, address to the Office of the Company, 15, York Place, LEEDS.

POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles.*

One ton yields 12¼ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, West Riding and Silkstone Collieries, near LEEDS.

OLD WEMYSS CANNEL COAL.—Yield of gas per ton, 12,896 cubic feet; illuminating power, 31·75 standard candles. Port of shipment, Wemyss.

Analysis and price on application to Mr. WM. CAREY, Manager, Wemyss Colliery, Kirkcaldy, FIFE.

CANNEL COAL.

MESSRS. GRIFFITHS BROTHERS,
COPPA COLLIERY, MOLD,

Beg leave to call the attention of Gas Companies to the superior quality of their Cannel for gas-making purposes.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

Ports of shipment—Birkenhead or Connah's Quay.

Waggons supplied for delivery by railway to any part of England or Wales.

For particulars, prices, and rates of freight, apply to GRIFFITHS BROTHERS, Coppa Colliery, Mold, FLINTSHIRE.

THE
HUCKNALL COLLIERY COMPANY
Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.

Prices and information on application to the HUCKNALL COLLIERY COMPANY, Hucknall Torkard Collieries, near NOTTINGHAM.

THOMAS EDINGTON & SONS,
PHŒNIX IRON-WORKS,
GLASGOW,
Manufacturers of all kinds of
GAS AND WATER PIPES,
Branches, Bends, Water-Traps, Tank-Plates, Valves, and general Castings. Also
RAILWAY CHAIRS & SLEEPERS,
AND
GRIFFIN'S PATENT PERMANENT WAY.
London Office, 63, Old Broad Street.

WALTER MABON & CO.,
Engineers,
ARDWICK IRON-WORKS,
FAIRFIELD STREET, MANCHESTER,
MANUFACTURERS OF
IRON TANKS, GASHOLDERS,
GAS APPARATUS,
PIPES, VALVES, IRON ROOFS,
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DESIGNS, SPECIFICATIONS, & ESTIMATES FURNISHED.

FIRE-CLAY GAS-RETORTS, &c., CANNEL AND STEAM COALS.

WILLIAM FRASER, Inverkeithing (owner of the Works at which Fire-Clay Retorts were first made), having greatly enlarged his Works, can supply RETORTS and other FIRE-CLAY GOODS to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

WILLIAM FRASER ships COWDENBEATH PARROT COALS at Charlestown and Burntisland at 11s. per ton; and HALBEATH STEAM COALS, on Navy List, at 7s. per ton.

INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE.

J. T. B. PORTER & CO.,
GAS ENGINEERS,
MANUFACTURERS AND CONTRACTORS FOR GAS-WORKS
Of any extent at Home and Abroad,
GOWTS BRIDGE WORKS, LINCOLN,
AND
JOHN STREET, ADELPHI, LONDON, W.C.

HICKMOTT'S VERTICAL GAS GENERATOR.
GREAT ECONOMY IN GAS-MAKING.
This Generator is charged with Coal by gravity, direct from waggons. The Coke is extracted with a minimum of labour. Fifty per cent. of labour saved, and all distressing labour obviated. Gas of high illuminating power, and desulphurized Coke of great density, suitable for metallurgical purposes.
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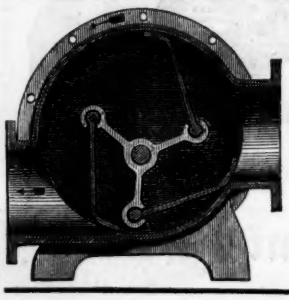
HICKMOTT'S PATENT METHOD OF LAYING WROUGHT-IRON SERVICE-PIPES,
Whereby they are rendered everlasting. For particulars, apply to the above address.



CHARLES HORSLEY'S
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(From 250 Feet upwards per Hour.)
Also,
ROTARY TAR AND OIL PUMPS.
For particulars and prices apply to the Patentee,
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ROBERT DEMPSTER,
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R. D. recommends his Fire-Brick Retorts to Engineers and Managers of Gas Companies; they last from 10 to 12 years.

Iron and Fire-Clay Retorts.
Annular and Pipe Condensers.
Scrubbers and Purifiers, all sizes.
Steam-Engines and Exhausters.
Hydraulic Centre-Valves.
Station-eMters and Governors.
Photometers & Pressure-Gauges.
Lamp-Posts and Brackets.
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Gasholders, Single-Lift or Telescopic.
Gas Castings of every description.
Retort Setters and Fitters sent to all parts of the country.
Wood Sieves for Purifiers.

Plans and Specifications prepared.

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GAS ENGINEERING WORKS, EXETER,
CONTRACTORS FOR THE ERECTION OF GAS-WORKS,
MANUFACTURERS OF IMPROVED WET & DRY METERS;
Also, EVERY DESCRIPTION OF GAS APPARATUS,
Comprising GASHOLDERS, STATION-METERS, GOVERNORS, CONDENSERS, PURIFIERS, RETORTS, SLIDE-VALVES, and every article appertaining to Gas-Works.
Gas Companies advised on Improvements, Extensions, and Alteration of Works.
*** The very best material and workmanship guaranteed, and at prices bearing a favourable comparison with any House in the Kingdom.

SAMUEL CUTLER & SON,
CONTRACTING GAS ENGINEERS, &c.
MANUFACTURERS OF GASHOLDERS, TANKS, PURIFIERS,
AND ALL DESCRIPTIONS OF GAS-MAKING APPARATUS.
Iron Roofs, and General Iron Work. Mains Supplied and Laid.
S. C. & SON supply every requirement for a Gas-Work, and keep in stock Retort-Lids, Cotters, Barrows, Scoops, Bolts and Nuts, &c., &c.
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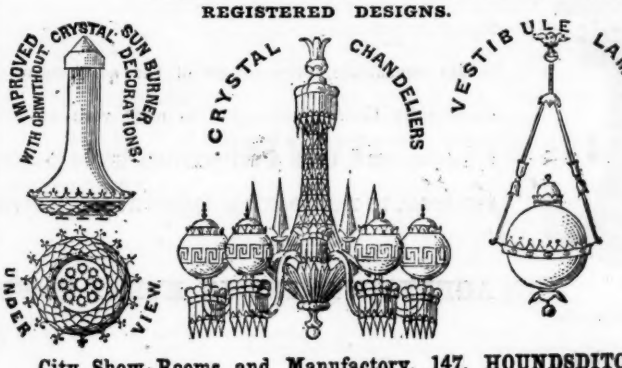
MANUFACTURERS OF
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, AND THE PATENT CRYSTAL ILLUMINATION;
Vestibules, Iron Barrel, Composition Tubing, Dry & Wet Meters, & Gas-Fittings
OF EVERY DESCRIPTION.
WORKS: LONDON, BIRMINGHAM, & PARIS.
REGISTERED DESIGNS.



Special Designs prepared in perfect accordance with architectural arrangements. Estimates furnished for the Lighting and Fitting up of Theatres, Music Halls, and Public or Private Buildings with Gas.

GAS MOONS of the newest designs.

The Patent Gas-Regulator and Purifier reduced to 6s. 6d. per Doz.

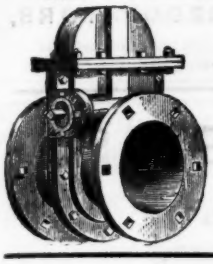
Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1870, are now complete.

City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.
ESTABLISHED 1803.

REDUCED PRICES
OF
B. DONKIN & CO.'S
IMPROVED GAS-VALVES
WITH WROUGHT-IRON PINIONS,

TRADE MARK.

From 2 inches to 18 inches, price 9s. 6d. to 12s. per inch diameter.



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These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.

VALVES MADE WITH OUTSIDE RACKS TO ORDER.

ALSO,

SCREW WATER-VALVES WITH GUN-METAL FACES.

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GENERAL ENGINEERS AND IRONFOUNDERS,

MAKERS OF STEAM-ENGINES,

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GAS AND CONSULTING ENGINEER,
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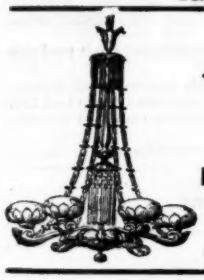
INVENTOR & PATENTEE of CAST-IRON & FIRE-CLAY RIBBED RETORTS.

Mr. Fraser having had more than Twenty years experience in the Construction, Alteration, and Management of GAS and WATER WORKS, will be happy to furnish information on all matters appertaining thereto.

Plans, Specifications, and Estimates prepared.



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MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

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GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,
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Station-Meters, Governors, Consumers Meters, Gas Lustres, Chandeliers, Brackets, &c., and every description of Gas-Fittings and Gas Apparatus.

GEORGE ANDERSON,
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MR. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress on the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan.*

SCHOLL'S
PATENT PLATINUM
GASLIGHT PERFECTER.

Extract from Report by Dr. Letheby:—

"The results have been very remarkable, for they show an average increase of 63 per cent. on the illuminating power of the gas. I am of opinion, therefore, that the invention is of great practical value."

Price 1s. each for Fishtail Burners.

To be had retail of Gas-Fitters and Ironmongers, and wholesale of

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Terms on application. N.B.—A specimen sent free on receipt of Twelve stamps.

*** Further testimonials from Drs. Frankland and Crooks, showing the great practical value of this invention, will be shortly published.

PRICE'S PATENT COKE & COAL BARROW,

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Gas-Works, HAMPTON WICK.

HOPKINS, GILKES, & CO.,
LIMITED,
MIDDLESBOROUGH,

SUPPLY GAS & WATER PIPES of EVERY SIZE.

Plain, Turned and Bored, and Coated.

CAST-IRON RETORTS.

Castings for Gas-Works of every description.

EXHAUSTERS.

LONDON OFFICE: 95, CANNON STREET.

WATER-WORKS FITTINGS,
SLUICE COCKS, FIRE COCKS,
METERS, STEAM FITTINGS,
GAS & HOT-WATER VALVES, &c.,
Of First-class Materials and Workmanship.

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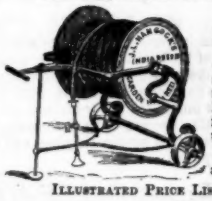
HANCOCK'S INDIA-RUBBER HOSE-PIPES,
FOR WATERING GARDENS, LAWNS, &c.



Made in 60 ft. lengths, and best make only.

Brass branches, with stop-cocks, jets, and spreaders, and union joints for connecting any size Hose. HOSE REELS (galvanized iron or painted) for winding up the Hose.

Orders promptly executed, and

ILLUSTRATED PRICE LISTS ON APPLICATION.

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NAPHTHALINE
IN GASHOLDER INLET-PIPES.

With Livesey's Patent Man-Lid these Pipes can be examined and cleansed without loss of Gas, with the greatest facility and without any risk.

Cost of the Apparatus, to cover two 18-in. pipes, about £10.

Royalty: At the rate of 1s. per foot diameter of each Gasholder, and no further payment.

LIVESEY'S SYSTEM OF WATER-VALVES
FOR PURIFIERS

Will effectually prevent that contamination of the pure Gas which so frequently occurs where the ordinary Valves are used. They are much less costly, easily applied, and, being simple castings, cannot well get out of order, while by their use it is found that the Gas will bear a continuous test for Sulphuretted Hydrogen for an indefinite time.

Application to be made to the Patentee, GEORGE LIVESEY, Engineer, South Metropolitan Gas-Works, S.E., where both inventions are in use.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

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MANUFACTURE EVERY DESCRIPTION OF

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WROUGHT-IRON WELDED TUBE AND FITTINGS,

BLACK AND GALVANIZED;

BRASS, COPPER, LEAD, TIN, AND COMPOSITION TUBING

STOCKS, TAPS, AND DIES,

And Every Description of Gas-Fitters Tools;

CAST-IRON GAS-MAIN COCKS,

WITH PATENT METAL PLUGS;

GAS SLIDE AND SLUICE VALVES;

CARTER'S SAFETY GAS-VALVES

GAS-STOVES, REGULATORS, BURNERS, &C.

Large Pattern-Book and Price List of Gas-Fittings price 7s. 6d., supplied on application.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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WALTER FORD,

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MANUFACTURER OF

WET & DRY GAS-METERS, STATION-METERS, GOVERNORS, &c.

SOLE MANUFACTURER OF

PADDON'S PATENT STREET-LAMP REGULATORS,

For ensuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

GAS AND WATER PIPES.

CLARIDGE, NORTH, & CO.,

BILSTON.

1862.

PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

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CLASS II.

This Paint having been in general use over eight years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

CARD.

D. BRUCE PEEBLES,

While thanking his numerous friends and customers for the liberal patronage they have hitherto bestowed upon him, begs to state that the business at Fountainbridge Works will in future be carried on under the firm of D. BRUCE PEEBLES & COMPANY.

With reference to the above, D. BRUCE PEEBLES & COMPANY beg to intimate that, in order to meet the growing requirements of their increasing business in Gas-Meters and Gas Apparatus generally, they are building large additions to their premises. The demand for the

PATENT TIN-CASED WET AND DRY METERS,

WITH TONGUE & GROOVE JOINT,

Has hitherto exceeded the capabilities of supply; but with a large addition to their Works, and the introduction of special tools, they hope soon to be able to execute orders from stock with punctuality and despatch, and to merit a continuance of the support which has so liberally been given to Mr. Peebles.

D. BRUCE PEEBLES & COMPANY,

ENGINEERS, WET AND DRY GAS-METER MANUFACTURERS,

BRASS FOUNDERS, & GAS APPARATUS MAKERS,

FOUNTAINBRIDGE WORKS, EDINBURGH.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short notice.

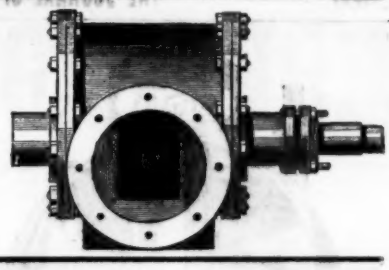
ROTATORY AND DOUBLE-ACTING GAS-EXHAUSTERS,

With many recent improvements, from 1500 to 150,000 cubic feet per Hour.

JAMES BURTON, SONS, & WALLER,

MAKERS OF ENGINES, MACHINERY, and IRONWORK for GAS-WORKS,
Efficient and durable TAR, LIQUOR, and SYPHON PUMPS,
GAS-VALVES, with or without Wedges, worked with powerful Worm and Rack,
SELF-ACTING BY-PASS VALVES, with Lid and Relieving Lever,
ROTATORY, TUMBLER, and CAPILLARY WATER DISTRIBUTORS for SCRUBBERS,
SMALL-SIZE EXHAUSTERS KEPT IN STOCK.

JOHN'S PLACE, HOLLAND STREET, SOUTHWARK, LONDON, S.E.



KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.

KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

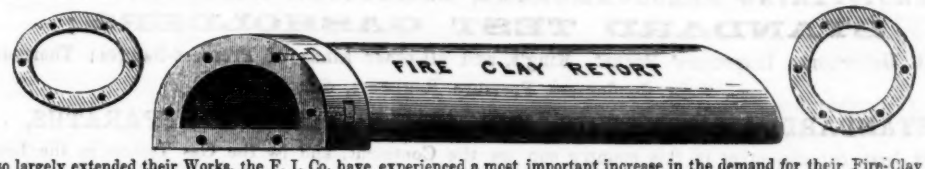
Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Bars, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

Agent in Ireland—Mr. JAMES FURNESS, No. 3, POWNES STREET, DUBLIN.

THE FARNLEY IRON COMPANY,

FARNLEY, near LEEDS.



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The F. I. Co. generally hold in stock, for immediate supply, Fire-Bricks of every size and kind—Tiles, Sanitary Tubes, Ornamental Terra-Cotta Ware White Facing Bricks, the White, Buff, and other Glazed Bricks and Tiles, in various colours and shapes, &c., as well as the Brown Salt-Glazed Bricks, &c., &c.

Prices, Drawings, and all other information may be obtained by applying as above, or to

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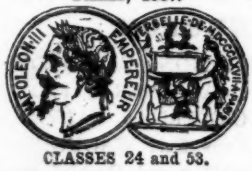

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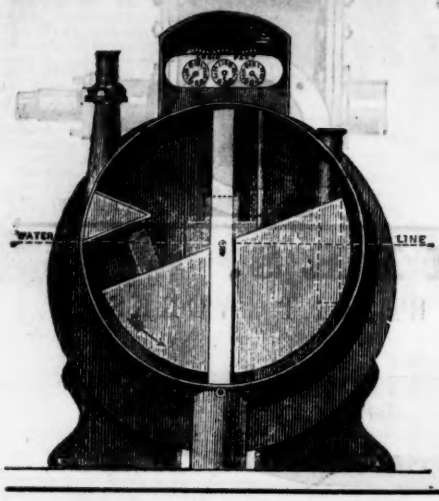

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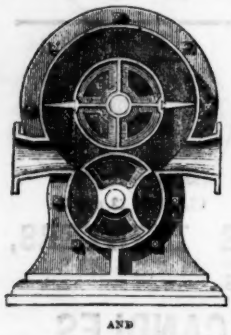

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